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Monographs Acquisitions: Staffing Costs and the Impact of Automation

Dilys E. Morris, Pamela Rebarcak, and Gordon Rowley

In this article, the authors examine the staff costs involved in monograph purchases by Iowa State University (ISU) Technical Services and explore the impact of automation on these costs between 1990 and 1995. They demonstrate that acquiring a monograph is now comparatively expensive relative to the costs of cataloging. They describe the impact of staff overhead costs on product or service costs and highlight the impact of professional responsibilities on costs. The authors further demonstrate that the automation of monographs acquisitions, in the main, has really only mechanized former manual processes and has done little to change the fundamental principles underlying the work or provide opportunities for innovation. Lastly, although cost data for collection development has not been documented, the authors explore the relationships between collection development and automated acquisitions, relationships that influence costs.

Throughout much of the twentieth century the professional literature has presented surprisingly little relevant cost data about libraries. Leung (1987) noted that the scarcity of cost figures for cataloging was mirrored by inadequate cost data for all other library functions as well. These findings confirmed an earlier study by Dougherty and Leonard (1970) that covered the years 1876–1969. In recent years, however, there has been a growing awareness of the need for cost studies. Such studies have risen in importance because they serve as relative performance barometers for librarians and, more importantly, because they allow for comparisons over time (Leung 1987).

Iowa State University (ISU) Technical Services initiated a time and cost study in 1987 to investigate the impact of automation on services and products. Typically, interest in cost studies has been sparked by two additional factors: heightened institutional expectations for accountability and genuine fiscal restraints. Fluctuations in costs can reflect changes in many aspects of library operations, including organization, policies and practices, adjustments in workflow and the use of automation.

Bedford (1989) suggests three key reasons for conducting cost surveys: (1) to provide a management tool for controlling the costs of technical processing func-

DILYS E. MORRIS (dmorris@iastate.edu) is Assistant Director for the Technical Services Division at Iowa State University; PAMELA REBARCAK (zager@iastate.edu) was Head of the Monographs Acquisitions Department during the study and has since become Principal Social Sciences Bibliographer; GORDON ROWLEY (gsrowley@iastate.edu) is Assistant Director for the Collections Division. Manuscript received May 12, 1996; accepted for publication July 9, 1996.

tions; (2) to manage technical processing functions with a progressive and dynamic approach; and (3) to compare cost information across academic research libraries in order to gain insights into factors that have direct effects on cost levels. Kantor (1989) also supports cost studies because of their usefulness for managers. In addition, he asserts that cost information can be used to justify the costs of library operations to those who pay the bills and to motivate both staff and managers into action.

The ISU Technical Services time and cost study substantiates the opinions of others writing on the benefits of cost analysis. The real costs of divisional services are known; therefore, comparisons of the relative costs of different services are possible. A time and cost analysis reveals how administration, meetings, professional service and scholarship, and other overhead staff costs add significantly to service costs. This information enables staff to see more clearly the costs of the services they deliver and to gain a better understanding of the cost implications of practices and policies. Additionally, it helps managers to make decisions on redirecting staff effort, and it allows both staff and management to better understand and accept the need for change.

ORGANIZATIONAL STRUCTURE FOR MONOGRAPHS ACQUISITIONS

Acquisitions at ISU Technical Services is divided into three functional areas: serials acquisitions, monographs acquisitions, and payments. Payments staff handle both monographs and serials, and it is not possible to sort costs by monographs work only. Therefore this analysis excludes the costs of activities associated with payments for monographs. In addition, collection development responsibilities are in the Collections Division, and these costs also are not included.

ISU Library is an unusually centralized system with one branch library and three reading rooms. Because Technical Services functions have never been distributed there is a unique opportunity to look at total technical service activities. No monographs acquisitions functions are delegated to branch facilities. They do not maintain official on-order files or have any responsibilities for claiming or reconciliation of orders.

During the study, staff in the Monographs Acquisitions Department handled all acquisitions tasks, including all order, receipt, and vendor functions. The only exception was pre-order searching. Staff members in the department evaluated vendor services and discounts, negotiated changes, monitored the budget, referred fund allocation problems, and assured expenditure of the budget. The staff involved in monographs acquisitions included library assistants, some students, and a faculty department head. Since the study's completion, the department head position was eliminated, and monographs acquisitions is now a unit of a larger Acquisitions Department. Pre-order searching, then and since the study, is done by copy catalogers in the Monographs Copy Cataloging Department, and the costs are included in the study.

The ISU Library used the CARLYLE online catalog until it migrated to NOTIS in August 1990. Planning for NOTIS monographs acquisitions implementation began in the 1991–92 academic year. Firm orders and their payment were automated in July 1992, and one year later NOTIS monographs implementation was completed with the addition of approvals and standing orders.

In 1994–95, $1,415,000 was spent on monographs. Nearly 27,000 volumes and more than 2,000 nonbook pieces were purchased. Forty-one percent were received because of a firm order, 24% by approval, 21% by approval form orders, and 14% by standing orders. Nearly 3,000 monograph gifts were processed. During 1994 an approval vendor review was conducted, and in January 1995 the Library changed its major domestic approval vendor. Work is progressing to increase receipts by approval.

METHODOLOGY

TIME AND COST SAMPLING

Five times each fiscal year Technical Services staff track all time worked for an

entire week. The sample weeks are spaced 10 weeks apart. Staff record their time within broad product and service centers, and each of these cost centers is divided into tasks.

Each Product and Service Center includes all the time associated with that activity except meetings. Since many meetings are not limited to a center, all meeting time is collected under Support Activities.

Position numbers identify staff within the organizational structure and allow sorting of data in different ways. Staff normally complete their time sheets anonymously. The data are never used for individual performance evaluation.

The exact salary for each employee is collected for every sample week, and benefits are included. Hourly salaries are determined, and the task cost by employee calculated. Task times and costs are summed and form the basis for all analysis.

Production Units and Cost Analysis

In order to determine the costs of products and services, production units must be determined. For monographs acquisitions, total receipts are used. Receipts are basically a volume count. For nonbook material, pieces are counted, except for microfiche, in which case a title count is used to prevent inflation of production units. Production statistics are now submitted for the sample week period. Prior to 1994–95, production units were extrapolated from monthly statistics.

The number of items received is divided into staff costs to arrive at a cost per activity. In order to understand relative costs of the varying acquisitions activities, "receipts" is used as the constant pricing unit. This allows the following costs to be calculated and compared: cost per receipt to search orders, cost per receipt to place orders, cost per receipt to claim orders, cost per receipt to receive material, cost per receipt to maintain order records, cost per receipt to solve problems and monitor costs, and cost per receipt for training and documentation.

In addition, the overhead center costs must be apportioned to the acquisitions tasks. These overhead costs are paid leave time (sick, vacation, and holidays) and support activities (administration, meetings, personal, professional work, etc.). Overhead costs can be assigned at both the department or unit level and for the entire division with varying results. The costs are presented in three ways: (1) cost of acquisitions tasks only: no overhead, (2) cost of acquisitions tasks with departmental overhead, and (3) cost of acquisitions tasks with divisional overhead.

One more cost adjustment is made. Faculty and Professional and Scientific staff who work over 40 hours are not paid for these additional hours. Since the methodology calculates costs by multiplying a staff member's hours worked by her hourly salary, the bottom line can include costs not paid. A formula is used to remove the unpaid "over 40" costs. In this analysis the two different costs are referred to as: Costs: Hours Paid; Costs: Hours Worked.

Costs are shown in the dollars paid during the sample weeks and also are adjusted for inflation to 1994–95 dollars.

Results

Over the course of the five-year study, time spent at monographs acquisitions dropped by 15% (an average reduction of 38 hours per week). By 1994–95 monographs acquisitions tasks accounted for 37% of the total time spent at acquisition functions in Technical Services. Serials Acquisitions accounted for 45% of the balance and Payments for 18% (see figure 1).

For this study monographs acquisitions tasks were combined into seven major functions: Searching, Ordering, Claiming, Receiving, Maintenance, Problems and Costs, and Training and Documentation. The results of each will be discussed separately.

Searching

Order searching includes determination of relationships between editions, location and transfer of OCLC cataloging records, duplicates detection, and prelimi-
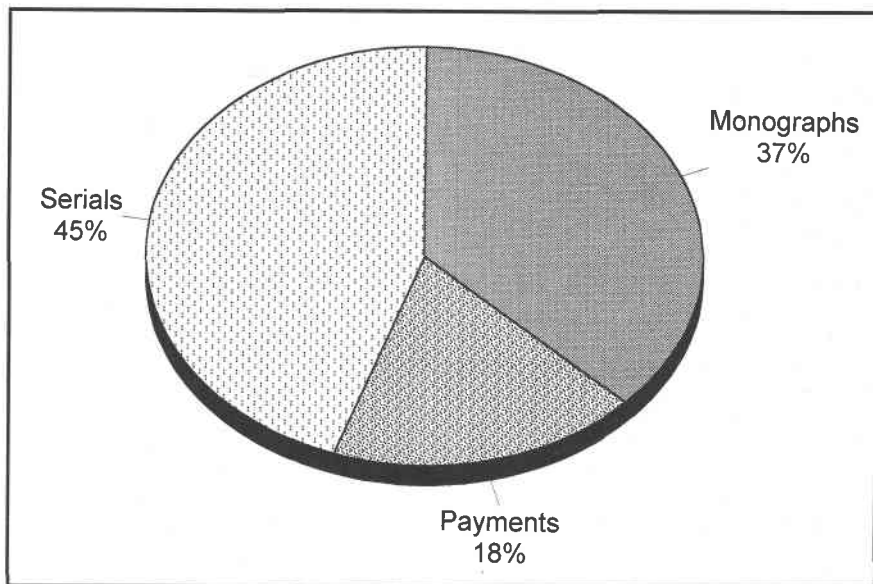
Figure 1. Distribution of Acquisitions Time in Technical Services, 1994–95.

nary cataloging authority work (series and some authors). It is the third largest acquisition task, averaging 12% of the total acquisitions time and under 30 hours per week (see figure 2).

Over the course of the study, the average weekly hours dropped and productivity increased, with the exception of 1993–94. An average of 16 orders an hour are now searched. Ten percent are not ordered mostly because of duplication and are returned to the selector (see table 1).

ORDERING

This task includes price and vendor determination, NOTIS record creation, revision and, formerly, typing order records. This is the second largest task averaging about 50 hours per week. (see figure 2). The time devoted to this task dropped greatly over the course of the study until the last year when orders jumped sharply upward, increasing more than 70%. Productivity increased, and currently eight orders an hour are placed (see table 2).

In 1994–95 revision accounted for 21% of the task time, price and vendor determination 11%, and NOTIS record creation the remaining time.

CLAIMING

Claiming includes correspondence for-

TABLE 1

WEEKLY AVERAGES: SEARCHING

Year	Hours	Orders Searched	Hourly Rate	% of Total Time	Return %
1990/91	42	307	7.5	15.0	16
1991/92	34	253	7.3	14.4	19
1992/93	24	221	13.7	9.6	9
1993/94	34	298	8.6	15.0	9
1994/95	28	446	15.9	11.8	10
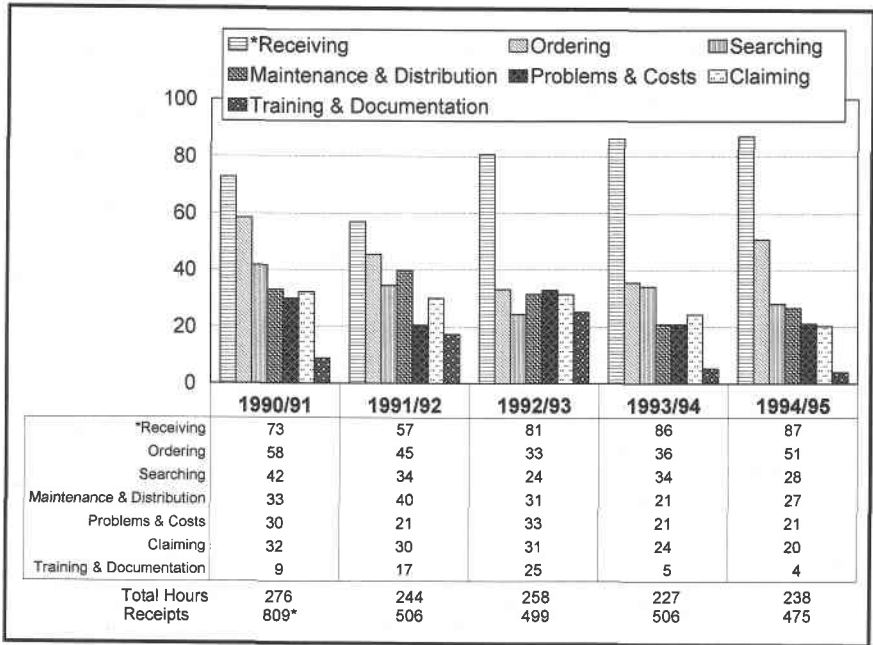
Figure 2. Average Weekly Hours for Monographs Acquisitions.

mulation, NOTIS claim generation, record updating and, formerly, claim typing. Claiming is one of the smallest activities, requiring about 20 hours per week (9% of total time), and ranking sixth out of the seven tasks. Over the course of the study, its time dropped by over 30% and productivity increased (see figure 2).

RECEIVING MATERIALS

Receiving includes opening and sorting mail, opening boxes, checking in, posting expenditures, detecting and referring fund problems, solving problems, and sorting for cataloging. It is the most time-consuming task, averaging nearly 90 hours a week, and accounts for 36% of monographs acquisitions time (see figure 2). Unlike the other tasks, it grew over the course of the study and productivity declined. About 6 items are received per hour (see table 3).

MAINTENANCE AND DISTRIBUTION

This task includes pulling, filing, and clearing records, mail preparation, sorting, shelving, and distributing materials,

TABLE 2
WEEKLY AVERAGES: ORDERING

Year	Hours	Orders Placed	Hourly Rate	% of Total Time
1990/91	58	263	4.6	20.8
1991/92	45	183	4.0	18.8
1992/93	33	213	7.0	12.9
1993/94	36	273	7.2	15.6
1994/95	51	411	8.1	21.5

TABLE 3
WEEKLY AVERAGES: RECEIVING

Year	Hours	Receipts	Hourly Rate	% of Total Time
1990/91	73	809	11.0	26.5
1991/92	57	506	9.0	23.4
1992/93	81	499	6.4	31.0
1993/94	86	506	6.0	37.6
1994/95	87	475	5.6	36.1

functions that do not fit elsewhere. It ranks fourth in time, involves over 26 hours weekly and represents 11% of total time (see figure 2). Its time fluctuated over the course of the study but did drop.

PROBLEMS AND COSTS

This task includes cost monitoring, consulting and referring on acquisitions issues, and problem-solving that requires a greater than normal effort. It is not routine problem-solving. This is the third smallest activity, and time fluctuated over the course of the study (see figure 2). It accounts for 9% of total acquisitions time and around 20 hours per week.

TRAINING AND DOCUMENTATION

This includes training time where no work is accomplished (e.g. the time of the trainer, trainee reading documentation). If a staff member is training while performing a task and accomplishing work, the time is counted in the task being learned. This task also includes all time for policy and procedure preparation. This is the smallest activity, representing an average of 4 hours weekly, i.e., less than 2% of total time. Time in this activity declined, but there was major variance over the course of the study (see figure 2).

STAFF COSTS

In table 4, the average weekly staff costs over the years of the study are compared. It shows dollars paid during each year and has not been adjusted for inflation.

It shows the average weekly cost for each of the seven acquisitions activities and provides a weekly total. As explained earlier, the weekly cost is presented in two ways: Hours Worked and Hours Paid.

Hours Paid represents the real costs to the institution. Table 4 also gives the average cost per receipt of acquiring a new monograph. Costs can be seen both with and without staffing overhead applied. In fiscal year 1994–95, the average cost for acquiring a monograph without staffing overhead was $7.38. If the overhead staffing costs (leave and support activities) at the departmental level are apportioned, the cost increases by 47% to $10.85. With the addition of divisional overhead, there is a further 20% price increase to $13.01 (see table 4).

By using receipts as the pricing unit, the relative 1994–95 costs of the seven major acquisitions activities can be compared as shown in table 5.

Receiving is the most costly task, followed in descending order by Ordering, Searching, Problems and Costs, Claiming, Updating and Maintenance, and Training and Documentation. Costs fluctuate from week to week depending on the time spent on tasks and the average salary paid to do the tasks. The five weeks sampled in 1994–95 were:

- September 5–11 Labor Day Holiday
- November 13–19 No meeting week
- January 22–28 ALA Annual Meeting
- April 1–7
- June 10–16

It is possible to compare staffing costs over the course of the study if the costs are adjusted for inflation as measured by the

TABLE 4

WEEKLY AVERAGE COSTS

	1990/91	1991/92	1992/93	1993/94	1994/95
Task Costs ($)					
Receiving	905	672	1160	1251	1270
Ordering	712	592	449	433	728
Searching	527	435	334	474	437
Problems/Costs	530	369	610	378	422
Claiming	343	340	417	318	306
Updating/Maintenance	278	414	364	227	306
Training/Documentation	157	310	515	98	67
Totals ($)					
Hours Worked	3452	3132	3850	3180	3538
Hours Paid	3382	3099	3819	3170	3504
Overhead Apportioned					
Departmental	5239	4981	5296	4778	5154
Technical Services	6029	5098	6125	5123	6179
Cost Per Receipt ($)					
Task only	4.18	6.13	7.65	6.27	7.38
Overhead Apportioned					
Departmental	6.47	9.85	10.61	9.44	10.85
Technical Services	7.45	10.08	12.27	10.13	13.01
Production Statistics					
Receipts	809	506	499	506	475
Orders	263	183	213	273	411

Higher receipts in 1990/91 due to gifts.
Higher orders in 1994/95 due to domestic Approval vendor change.

Consumer Price Index for Urban Wage Earners and Clerical Workers. Figure 3 shows that weekly costs dropped from $5,860 to $5,154, or 12%. That decline correlates to the 15% time reduction. The same adjustment is made for the per-receipt cost in figure 4.

In the analysis that follows, the cost with departmental overhead ($10.85 per receipt) will be used.

ANALYSIS OF RESULTS AND THE IMPACT OF AUTOMATION

COSTS

Over the course of the study costs dropped by 12% when adjusted for infla-tion but time dropped by 15%. While po-sitions were cut, there were also many reclassifications that raised salaries. With automation, the clerical tasks were elimi-nated and staff worked more inde-pendently. To use automation effectively, processing should be completed at first handling whenever possible. This re-quires staff to have a broader knowledge, work with little revision, and solve more problems.

The $10.85 cost to acquire a mono-graph volume came as a surprise to ISU Technical Services because it is as expen-sive as cataloging, a cost that is being ques-tioned nationally. Cataloging costs are by title and acquisitions by volume, so com-

TABLE 5
COST PER RECEIPT 1994–1995

| | Hourly Wage ($) | Task Only ($) | Overhead Apportioned | |
			Departmental ($)	TS ($)
Receiving	14.58	2.65	3.90	4.67
Ordering	14.35	1.52	2.23	2.68
Searching	15.62	.91	1.34	1.61
Problems/Costs	19.95	.88	1.29	1.56
Claiming	15.09	.64	.94	1.13
Updating/Maintenance	11.50	.66	.94	1.13
Training/Documentation	16.17	.14	.20	.24
Totals		7.38	10.85	13.01
Percent increase			47%	76%

parisons are a little tricky. The following monographs cataloging costs cover all cataloging, including original.

1994–95 CATALOGING COST PER TITLE
Task only $6.30
Departmental overhead   11.10
TS overhead   11.41

Cataloging has a lower task cost at $6.30 per title compared to $7.38 per volume for acquisitions. Cataloging has a higher overhead because of the higher percent of faculty involved. That issue will be discussed later. In addition, $10.85 is not the entire cost of monographs acquisitions, because it excludes all staff costs of selecting materials as well as the costs of paying and maintaining audit trails.

An acquisitions cost calculated on a per-receipt basis is sensitive to the total work environment and must be used with care. When adjusted for inflation, fiscal year 1990–91 shows the lowest per-receipt cost (see figure 4), but the highest weekly staff cost (see figure 3). The major factor in lowering the per-receipt cost in 1990–91 was the number of gifts processed. Gifts require the least staff processing time, and their addition is not controlled by the acquisitions

budget. In addition there was an even split between approval and firm orders. Firm ordered materials require the most staff time and therefore carry a higher per-receipt staff cost. Over the last four years approval receipts at ISU have dropped by one-half. ISU changed approval vendors in January 1995, and approval coverage is expected to increase. This is expected to reduce the acquisitions staff costs not only in technical services but also in collection development.

While the lower costs of approvals can be deduced from the data, the ISU time cost study is not reliable at this level of specificity, primarily because the staff who handle approvals also handle gifts. During the five sample weeks of 1994–95, there was only one week when no gifts were processed. During this week only, comparison of costs for approval processing versus firm order processing revealed a 40% higher processing cost for firm orders. While this sample is too limited to make a valid comparison, the results do reflect what was expected, and furthermore, the findings are reinforced by studies done by Stevens (1996) and by Cargill and Alley (1979). Another caveat worth remembering when making comparisons of this kind is that staff specialize by order
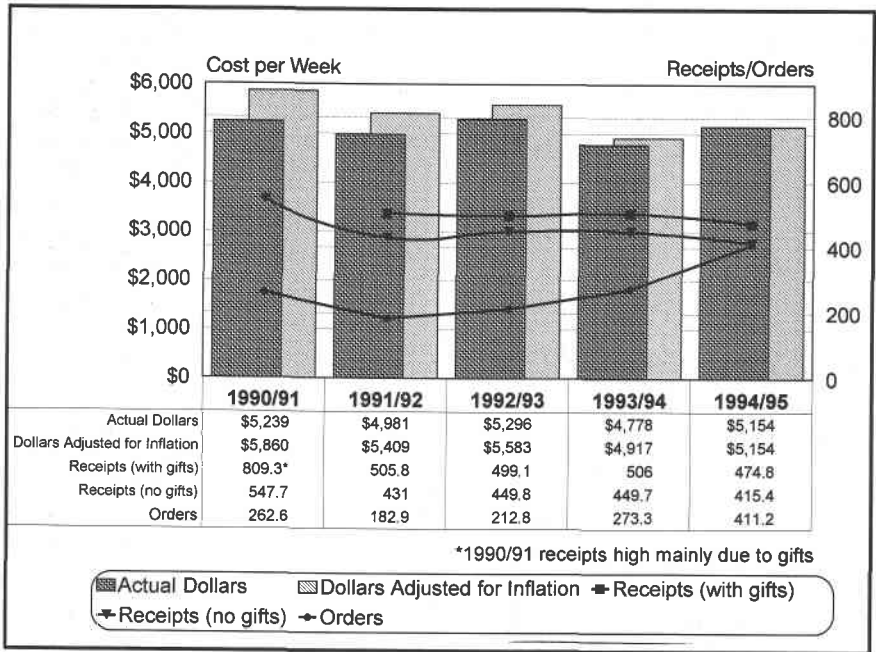
Figure 3. Weekly Cost Adjusted for Inflation.

	1990/91	1991/92	1992/93	1993/94	1994/95
Actual Dollars	$5,239	$4,981	$5,296	$4,778	$5,154
Dollars Adjusted for Inflation	$5,860	$5,409	$5,583	$4,917	$5,154
Receipts (with gifts)	809.3*	505.8	499.1	506	474.8
Receipts (no gifts)	547.7	431	449.8	449.7	415.4
Orders	262.6	182.9	212.8	273.3	411.2

*1990/91 receipts high mainly due to gifts
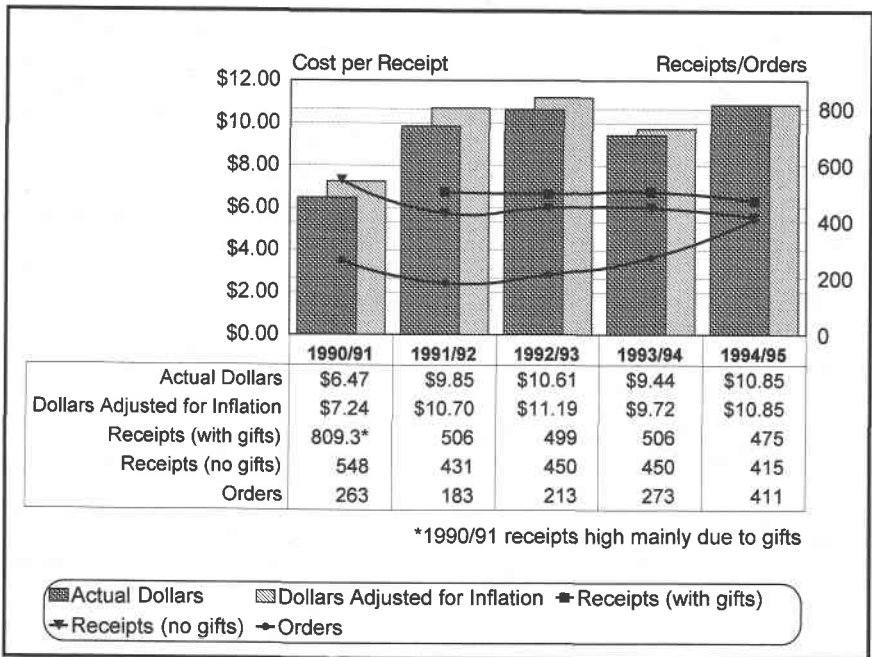
Figure 4. Cost per Receipt Adjusted for Inflation.

	1990/91	1991/92	1992/93	1993/94	1994/95
Actual Dollars	$6.47	$9.85	$10.61	$9.44	$10.85
Dollars Adjusted for Inflation	$7.24	$10.70	$11.19	$9.72	$10.85
Receipts (with gifts)	809.3*	506	499	506	475
Receipts (no gifts)	548	431	450	450	415
Orders	263	183	213	273	411

*1990/91 receipts high mainly due to gifts

type, and there are very few staff involved. At this detailed level of costing, the effectiveness of individual staff members can shape costs significantly.

CONTROLLING MONOGRAPHS ACQUISITIONS COSTS

While librarians at ISU intend to refine the NOTIS implementation of monographs acquisitions further and expect to push down costs, there are limitations. Hewitt (1989) points out that decision-making authority and the potential for self-determination are severely limited. He identifies four outside influences that impinge directly on acquisition's ability to meet day-to-day objectives:
• Acquisitions goals are set by collections development policies
• Output standards are set by cataloging
• Performance demands are set by users and public services
• Procedural requirements are set by accountants and auditors

Acquisitions staff must adapt and accommodate to the following unique operating conditions and expectations:
• Primary workload is determined by the number and types of orders placed
• Different types of receipts can increase labor intensity (e.g., firm orders as opposed to approval orders; foreign as opposed to domestic)
• Turnaround time is based on external factors: delivery service, vendor response, publisher turnaround, availability of item
• Fiscal calendar determines what is done and when
• Perceived and real accounting practices
• Inadequate software applications to support collections fund accounting expectations

Implementing automated acquisitions at ISU was complex for many of these reasons. There are many stakeholders throughout the library system, which makes it difficult to change policies and procedures. In addition, implementing NOTIS without any significant enhancements derived from local programming presented a rather inflexible system for

handling monographs acquisitions. Finally, the need for fiscal control and an audit trail limited experimentation. Thus implementation with slight variation mimicked the manual system. In comparison, when cataloging was first automated in 1977 with the introduction of OCLC, it was an activity completely controlled by Technical Services. This made it possible to revamp the entire workflow to optimize the use of an online system. Over the intervening years, continuing local refinement and national developments helped reduce cataloging costs.

FUND ACCOUNTING

As Phelps (1991, 35) has pointed out, "one of the problems in attempting to analyze the financial impact on technical processing of an integrated online system is the fact that the system both saves and adds costs." When the process involves library staff beyond technical services such as collection development, the potential for cost trade-offs is even greater. This became evident soon after ISU implemented the NOTIS acquisitions module. In order to accommodate system requirements a new process had to be devised for transferring money among the funds for purchasing monographs.

The fund structure developed internally for handling monographic purchases with the new automated system very closely resembled the previous one because Collection Development staff were familiar with that approach. The new fund names, their codes, and designations for types of monographic order—direct or firm orders, approvals, and monographic continuations—were already familiar and reduced the need for staff training. Nevertheless, the application of this design to fund management in the automated environment revealed that the system lacked flexibility as compared to the existing procedures. The automated acquisitions system does not allow expenditure or commitment of funds from an account when there is insufficient balance to support the transaction. Hence, funds now had to be transferred from one account to another in order to prevent the automated system

from refusing to process an order or receive a volume against an account that was already very heavily spent or encumbered. A procedure for interfund transfers was developed to enable Collection Development librarians (fund managers) and acquisitions staff to release orders and receive new material and for payments staff to track these transfers on the new system.

The procedure described above for initiating and tracking interfund transfers added new steps to the workflow, both in Technical Services and Collection Development. Sometimes these transfers involved more than one fund manager, but often a fund manager needed to move money from one fund under her purview to another for which she was also responsible. Yet in so doing, other staff became involved in order to track this activity in the automated system. For example, a selector might need to move money from her monographic firm order account to the corresponding approval account or vice versa. Although each task involved in this new procedure was not tracked for the purposes of this study, an analysis of the activity during the first three fiscal years in which this new interfund transfer procedure was available suggests that it is a new cost factor.

During the first fiscal period in which orders for monographs were processed through the automated system only 4.8% of the money tracked on the system was involved in an interfund transfer; during the second year this increased to 26.2%, and by the end of the third year just under one-third (33.2%) of the money handled on NOTIS for monographic purchases had also been included in an interfund transfer. Further analysis shows that in each of the three years the largest amount of money was transferred from approval lines to monographic firm order accounts; these data support conclusions also drawn from the cost-study analysis about the increase in firm order activity. Interestingly, many fund managers had to transfer funds among their own accounts. By the third year for which data were available, 12.4% of the interfund transfers represented activity among accounts managed by the same collection development librarian.

Not only do these data suggest budget planning issues to be explored, they also represent a new real cost to the library for carrying out this work.

Fund accounting formerly was separate from the acquisition tasks, done as an end process in the Library Business Office. Over-spending within fund accounts occurred because the system did not prevent it. Since fund accounting now occurs before an order can be placed or a book received, inadequate funds in an account stops the acquisition process. The interruption not only increases handling costs but also slows the acquisition process.

SEARCHING

As noted before, Technical Services order searching includes detection of duplicates, determination of relationships between editions, location and transfer of OCLC records to supply bibliographic descriptions for order records, and some preliminary authority work. In 1992–93 the number of duplicates found during Technical Services pre-order searching declined dramatically (see table 1). Two main factors influenced this reduction: changes to the withdraw and replace procedures, and the implementation of automated acquisitions. Automated acquisitions speeds entry of order requests into the online system and allows remote checking. Both features assist selection work and reduce wasted time in generating unneeded order requests.

In 1994–95 order searching prevented the unnecessary ordering of an estimated 2,000 monographs and the later work of handling unwanted titles. It prevented the expenditure of an estimated $12,000 in staff costs to order and receive these titles. In addition the precataloging work completed during pre-order searching speeds the cataloging process upon receipt.

At ISU, selectors still generate a paper order request that must be entered into the system. Acquisitions systems that automate order requests at the point of selection will reduce unnecessary work and assist selectors and users. Recent ISU studies demonstrate that slightly over 90% of the order requests have an OCLC

record to transfer into the NOTIS system at the time of order searching.

Online acquisitions increased the number of orders searched per hour, and thus, the cost of order searching declined. The ISU data show a puzzling drop in productivity during 1993–94. All investigation has failed at determining the cause.

ORDERING

With automation, the effectiveness of ordering increased dramatically as demonstrated by the increase in the hourly order rate (see table 2). The use of OCLC cataloging records to create order records reduced the order creation time and improved accuracy. As noted, over 90% of the monographs ordered in 1994–95 had an OCLC cataloging record at the point of pre-order search. Order placement accounts for 20.7% of total costs, with 12.2% being the actual NOTIS record creation, 5% revision and 3% price and vendor determination. As expected, revision time dropped dramatically in the automated environment. In the year preceding automation 12 orders were placed for every hour of revision. By 1994–95, 57 orders were placed for every hour of revision.

RECEIVING

Receiving accounts for 35% of the total cost of acquiring a monograph. In the year preceding automation, with receipts slightly higher, receiving accounted for only 23% of the cost. This dramatic increase was a surprise, but understandable once analyzed. The analysis identified work transferred to receiving and bottlenecks in the online environment.

Problem-solving during receiving has grown as has the referral of materials to selectors. Both factors stop the receiving activity and increase handling. Bibliographic problems identified in receiving used to be corrected later by catalogers, but automated acquisitions requires earlier problem resolution. Changes in procedures unrelated to automation also increase handling. Selectors no longer automatically review all approval form se-

lections when received, and their requests to see individual titles upon receipt have increased. As noted earlier, automated fund accounting as implemented at ISU complicates and delays receiving and increases the work of selectors as well. Receiving functions require review to determine how greater efficiency can be achieved.

More items are received on each invoice now. This reduces the number of vouchers produced, added, assembled, and signed (and the number of invoices created). There is a cost savings for the Treasurer's Office when fewer checks need to be cut.

CLAIMING

Claiming continued to be a variable activity after automation, with time varying substantially from week to week. With automation it became a less labor intensive activity (see figure 2) as well as an enormously more productive activity. The number of claims sent increased by over 100% after automation.

MAINTENANCE AND DISTRIBUTION

As expected, automation dramatically changed record maintenance activities. The time spent filing and pulling records dropped from 14 hours a week to 2. This type of dramatic reduction in clerical activities changed the nature of job descriptions and the assignment of tasks. The time spent at mail preparation and material sorting, shelving, and distribution showed no change.

PROBLEMS AND COSTS

Problem resolution and costs, primarily handled by the most qualified staff, has the highest hourly cost. Over the course of the study the time spent monitoring costs remained fairly constant. More time was spent in 1994–95 because of the change in approval vendors and the associated cost analysis. While problem solving and consulting time dropped, this decrease appears to have resulted from a

change in management practice rather than automation. During the first year of NOTIS implementation, there was a striking increase in problem solving and consulting.

TRAINING AND DOCUMENTATION

NOTIS implementation initially increased the time spent at these tasks. The year before and the year after implementation saw a large increase in time, but afterwards training and documentation decreased. Since automating, the clerical level positions were eliminated and staff were reclassified to higher levels. Higher level staff traditionally show lower turnover rates and thus training time declines.

RELATIVE TASK COSTS

While the bottom line cost per receipt varied among weeks, the relative costs of the seven activities is quite consistent. During all five weeks receiving was always the most expensive task per receipt, and training, the least expensive. Ordering was the second most expensive task in 4 of the 5 weeks sampled. The task with the greatest variance was problems and costs. During the week when meetings were at a minimum, the lowest per-receipt costs were achieved.

In every year, receiving was the most expensive task. The first year of NOTIS implementation, 1992–93, shows the greatest fluctuation from the norm. Training and documentation grew to the third most costly activity from its normal bottom ranking. Solving problems and costing rose to the second ranking from its lower rankings. In 1991–92 maintenance rose from sixth to fourth, indicating the preparation and clean-up work necessary for automation.

OVERHEAD STAFF COSTS

Overhead staff costs (leave and support activities) are not unique to monographs acquisitions or technical services. They exist in every part of an organization. It is an important cost to examine when evaluating how to reduce costs. In 1994–95 departmental overhead raised the cost of monographs acquisitions by 47%. When the entire divisional overhead costs are applied, the costs increased by 76% (see table 4).

In figure 5, overhead costs for all of Technical Services are presented. Product and service centers represent 56.8% of Technical Services labor costs (acquisitions, cataloging, catalog maintenance, volume processing, conversion, automation), while overhead centers are 43.2% (leave 14.8%, support activities 28.4%). Figure 6 shows the same data for the two departments used in this study (Monographs Acquisitions and Monographs Copy Cataloging).

Leave is a cost area over which an institution has little control. Although one might assume that the cost for support activities could be easily reduced because an institution has considerable control over them, achieving this is difficult. ISU Technical Services has attempted to reduce these costs, but with limited success. Administrative costs have dropped due to reductions in administrative positions. However, the drop in administrative costs has not been as steep as the drop in positions, reflecting the fact that tasks are being reassigned to non-administrative staff rather than eliminated. Meeting time has also increased, except for 1992–93 when "No Meeting Week" was introduced. With fewer administrative positions, there is a greater emphasis on team management and thus more meetings.

ISU librarians have faculty status, with major expectations for research and scholarship and professional service. Over the course of the study, there was no reduction in professional activities even though Technical Services faculty positions dropped by 25% (from 16 to 12 positions). Faculty expectations, in fact, increased during the study period, and this phenomenon is clearly revealed by the data. Fewer people are spending more time at professional activities. When determining costs, anything done by faculty is very expensive, because of the heavy professional, service, and publication expecta-
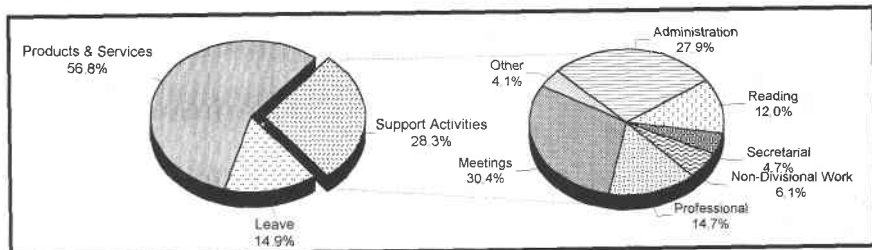
Figure 5. Technical Services Weekly Average Cost, 1994–95.
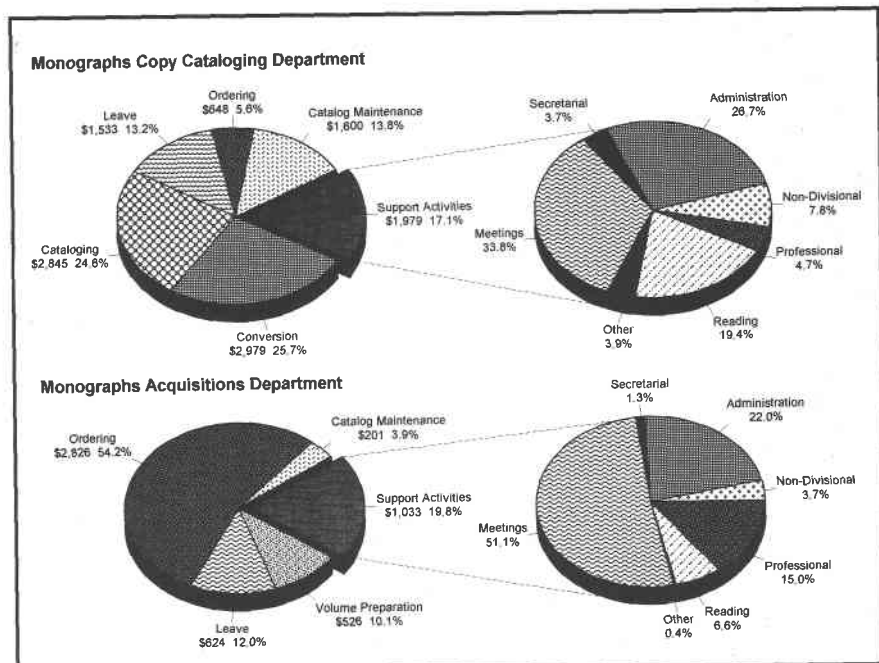
Figure 6. Departmental Weekly Average Costs, 1994–95.

tions. The time spent on these activities must be included in their direct service or product costs. For example, original catalogers, who are faculty, spend only 39% of their time cataloging. The remainder of their time must be calculated as overhead costs, which in 1994–95 increased the cost of original cataloging for a monograph by 170%. The higher cataloging overhead costs as compared to acquisitions overhead show the impact of staffing levels on costs.

Another growth area, general reading, applies to an ever increasing number of staff. It is necessary to keep abreast of the rapid changes in information technology. At the beginning of the study, general reading accounted for 2.4% of total Technical Services costs. It grew to 3.4% by 1994–95.

With the automation of acquisitions completed and with greater authority and responsibility invested in higher classified staff, the Serials and Monographs Acquisitions departments were merged and a department head position eliminated in January 1996. This will lower overhead costs.

FUTURE IMPLICATIONS

BEYOND MECHANIZED MANUAL PROCESSES

This study reveals that ISU Technical Services incurs considerable staff costs when it acquires a monograph. In fact, the full costs of acquisitions are not reflected in this study, since all selection, payment, and audit trail staff costs were excluded.

Automated acquisitions has mechanized formerly manual processes. It has taken past practices and allowed them to be performed better and faster, but the tasks themselves have remained virtually unchanged. Most of the automated enhancements support acquisition tasks. For selectors automation has done little more than improve the precision of financial information and provide immediate status information. It is time to move on to the second stage of technology adaptation, in which technology revises what is done, and things never done before become possible.

Developers of integrated library systems need to give greater attention to both the selection and the acquisition processes. Circulation and interlibrary borrowing data should be readily available in meaningful reports to support collection development. Library systems should allow the smooth transfer of information from users through the library selection and acquisition processes to vendors.

If acquisitions is to move to the second stage of technological adaptation, local system enhancements are not sufficient. Bibliographic utilities, book vendors, and librarians need to forge alliances to enhance cooperative activities and reduce duplicative activities; such a process would be similar to what has happened with cataloging.

Can bibliographic utilities and vendors develop new products that change local selection responsibilities? Is it possible for selection to become a more cooperative activity between vendors and bibliographic utilities, with local review varying according to local requirements? Is it possible to profile the automatic receipt of most materials so collection development can focus on newly emerging areas and on maintaining collections where a university's mission requires uniqueness or unusual breadth? Can bibliographic utilities and vendors working together develop selection profiles based on university programs? Can local acquisitions patterns be compared by disciplines to other institutions and to publishing output?

NEED FOR RESTRUCTURING

Rowley and Black (1996, 23) point out that while changing scholarly communications is having a major impact on the collection development mission, "collection development is one of the least addressed and yet highly critical areas in designing the future of information management and access." Their analysis shows that in most ARL libraries, collection development has changed little since the 1970s. While the authors find greater reliance upon technology and refinement of work at the task level, they explain that "refinements at the task level fall short of the restructuring required to support an efficient and effective response to the challenges ahead." The analysis of automated acquisitions at ISU corroborates these findings.

Could the acquisitions process and responsibilities be restructured, as Rowley and Black suggest, so that professional staff can "take on a greater role in the production of knowledge, at times contributing to the design of information products and other times functioning as a publisher or distributor" (p.27)? Selection duties are almost exclusively a professional responsibility, as cataloging once was. The ISU data demonstrate the high overhead costs associated with professional staff. If cooperation could forge new tools to support a more automated selection process, could review of receipts be delegated to a different level of staff, similar to the evolution of copy cataloging? If this were possible, professional collection development skills could be channeled to new areas resulting from the change in scholarly communications.

The "Stanford University Libraries Redesign Report: Redesigning the Acquisitions-to-Access Process" (1995) describes a major restructuring, and it will be important to analyze the results. This major undertaking is focused on Technical Services and does not appear to include the selection process. The redesign does forge broader alliances with vendors to increase efficiencies and is seeking greater assistance from bibliographic utilities in the provision of cataloging copy.

While the Stanford redesign effort concentrates on technical services, Sasse and Smith (1992), in their presentation at the 1991 Feather River Institute, examined the entire acquisitions process from selection through receipt. They pointed out the need for a bibliographer's workstation that would pull together local data and link selectors to external vendors and networks. They identified the opportunity for more mechanization of selection and new roles for collection developers, including user needs evaluation and a more active role in the creation of information.

STRENGTHENING COST ANALYSIS AS A MANAGEMENT TOOL

The ISU experience corroborates the opinions of Kantor (1989), Bedford (1989), Leung (1989), and others concerning the role that time and cost analysis can play in making important management decisions. While it is important to look at library effectiveness based on cost studies, the power of this management tool would be strengthened with more knowledge of user needs and behavior. In order to determine whether a service warrants the cost of providing it, more must be known about how users value the service. As automation reduces staff contact with users, encourages new user groups, and speeds the pace of change, new user needs and behavior emerge. Librarians have relied too long on impressions of users' needs based on service contacts. "It would clearly be in the best interests of the users of libraries and of librarians if

the findings of research could become a larger and more visible element in the decisions we make in managing libraries" (Hewitt 1983, 131). In addition, Penniman (1990) emphasizes the importance of costs and benefits to decision makers and notes that the libraries that compete less well, in either the private or public sector, are those "least prepared to express their value and contributions in terms understood by the their funders" (p.11).

Taylor (1986) examines the addition and assessment of value in the entire information arena. He sees information systems as formal processes encompassing both technology and people who add value to information. In his view, the total cost of the information process includes both the cost of providing information to the user and the cost of using the information provided. While acknowledging the oversimplification, Taylor believes generally that as information provision costs go down (e.g. library costs), user costs go up. The value-added approach emphasizes the need to look at user benefits and costs. The library acquisition process is a major component of providing information to users. Determining whether the cost is worth the value requires a better understanding of how the selection process provides what users need and to what degree that process gives the user the ability to access information in a timely manner.

CONCLUSION

The time and cost analysis at ISU sheds much light on the implementation of NOTIS monographs acquisitions, gives new insight into relative acquisition costs, and identifies policies and procedures that need further review. The study shows that following automation, staff time for monographs acquisitions dropped more than costs. The results are being used to understand the costs, to identify how they have changed, and to analyze workflow to reduce costs further. This analysis shows that automation can both save and add costs; however, the overall effect has been cost reduction and improved services.

We discovered very high technical

services staff costs involved in acquiring a monograph. We also found an automated environment that greatly mimics the former manual system with little opportunity for reductions in the Collection Development workload. Changing the acquisitions process has proven difficult because of the number of stakeholders involved and because of limitations of the automated system. Considering the significant additional costs of selection, payments, and audit records, monographs acquisitions is a more costly activity than cataloging. ISU acquisitions costs are probably similar to the acquisitions costs of many research libraries. Those libraries with more sophisticated acquisition systems or the programming support to enhance the NOTIS system probably are operating more effectively.

Since the library community and the book industry are clearly in the process of redefining their products, services, and procedures, tracking changes in operational costs becomes even more critical. Additionally, time and cost studies will assist the private sector in addressing both market needs and business opportunities more effectively. Just as the costs of cataloging were reduced by national cooperation, acquisitions requires more integration with bibliographic utilities, local systems, and vendors. This type of study will help us work together to reduce duplication further, lower staff costs, and find new ways to approach monographs acquisitions.

It is evident that to this point the monographs acquisition process has only been mechanized, and the tasks themselves have really not been altered in any meaningful way. We have simply improved the way we perform the same jobs. Future automation developments, in conjunction with restructuring, should support evaluation of what we do, rather than how we do it, and provide the opportunity to do things never done before. In addition to automating operations and doing new things, librarians must do a better job of evaluating the services provided and be able to articulate the value of those services.

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A Study of Cutter Number Adjustment at the Ohio State University Libraries

Magda El-Sherbini and John C. Stalker

The authors conducted a study of cuttering practice at Ohio State University Libraries to determine the extent of effort presently devoted to the practice and to suggest changes that would result in less work without adversely affecting the public. They determined that there would be little deleterious effect if cuttering were limited to classes M, N, and P, while the effort involved would be halved.

The assignment and adjustment of cutter numbers requires a substantial commitment of resources in copy cataloging. A recent OCLC Online Computer Library Center, Inc. (1994–1995, 4) research project report notes, "Cuttering is an expensive, time-consuming, and error-prone operation, and has never received as much intellectual attention as classification. For copy cataloging, the cutter number is the only item in the bibliographic record that routinely requires adjustment to ensure that the call number is unique and fits into the local shelf list. In many instances, except for cuttering, records could be automatically downloaded into the local system without manual processing." OCLC's research aims at developing an acceptable algorithm for automatic cuttering. Expert systems have also been suggested to help with cuttering (Drabenstott, Riester, and Dede 1992).

The Ohio State University (OSU) Libraries share this burden of adjusting cutter numbers in copy cataloging. In May 1995 library staff conducted a survey and

analysis of cutter number adjustments to determine their extent and nature. Staff also explored whether changes could be proposed to lessen the burden without defeating the purposes of book number assignment and providing a unique call number, all while minimizing deleterious effects on whatever other purposes cutter numbers might serve.

HISTORICAL BACKGROUND

Book numbers became an important issue in the 1870s. Two lengthy studies of book numbers appeared in the early 1980s (Lehnus 1980; Comaromi 1981). Barden (1937) provides an excellent, brief history of early developments. Direct patron access to collections and the development of "close classification" to arrange books on library shelves made book numbers necessary to provide an arrangement within ultimate subclasses. Charles A. Cutter (1878), Melvil Dewey (1879), John Edmands ("Plan for Numbering," 1878, 38) and Jacob Schwartz (1878) all contributed

MAGDA EL-SHERBINI (melsher@magnus.acs.ohio-state.edu) is Head of Cataloging and JOHN C. STALKER (stalker.1@osu.edu) is Head of Information Services, Ohio State University Libraries, Columbus. Manuscript received May 7, 1996; accepted for publication July 8, 1996.

to the early development of book numbers. *Library Journal* published a symposium titled "A Plan for Numbering" (1879). Jacob Schwartz, the librarian at the New York Apprentices' Library, developed the idea of mapping authors' names into numbers, and Cutter, Dewey, and Edmands contributed ideas and suggestions that resulted in the form of book number—a letter followed by a series of digits—now familiar to us as the cutter number.

Dewey originally preferred arrangement within ultimate subclass by date of accession, and W. S. Biscoe (1885), librarian at Columbia, urged a chronological arrangement at the Lake George ALA conference in 1885. His date-letters later found their way into Cutter's *Expansive Classification* and Dewey's *Decimal Classification*. Cutter realized that later additions to the collection might make strict adherence to alphabetical order difficult to maintain without considerable effort or lengthy numbers. In that case, he wrote, "either the names can be renumbered . . . or the precise alphabetical order can be disregarded. As very great accuracy is in this matter of little account, the latter course would generally be best." However, the distinction between the class number and the cutter number became blurred in some cases in order to provide an alphabetical list of subtopics, to enable autobiographies to precede biographies, to have translations follow originals, and for other purposes. Moreover, in an effort to make cutter numbers as brief as possible, the same author's name may be represented by different or fewer digits in a sparsely populated class than in a crowded class. Therefore, no simple formula can map an author's name into a number.

Because of the effort required to preserve shelflist order, Tomlinson (1932, 292) remarked, concurrently with Brown (1932), that "a veritable epidemic of libraries . . . do not use the Cutter book number" in order to achieve savings of time and effort in the workroom. She further asked, "Are cutter numbers doomed?" For large libraries, she noted that the time and effort saved in the workroom might be shifted to patrons and

shelvers. Therefore, librarians at the OSU libraries decided to measure the amount of time and effort dedicated to maintaining a strict order of cutter numbers in order to determine whether changes in current practice could decrease that time and effort.

THE COMMITTEE CHARGE

The Cataloging Policy Advisory Council (CPAC) was charged with studying existing copy cataloging procedures to assess whether it was feasible to eliminate the review and adjustment of cutter numbers in producing copy cataloging records. A change in this procedure might reduce processing costs and improve productivity.

METHODS

CPAC produced a list of questions that was sent to the Cataloging Policy Board (CPB). CPB devised a survey and asked the head of Copy Cataloging to gather data on monographic records over a one-week period.

Information gathered in the survey can be grouped into four general categories:
1. Class, language, date of publication, location, record type, or record level in which the cutter number was adjusted
2. Presence of cutter number
3. Type of cutter number
4. Reason for adjusting cutter number

A total of 1,046 survey sheets were gathered, and survey results were loaded into an Excel spreadsheet. The SAS statistical package was used to analyze the data and produce statistical tables.

BACKGROUND ON THE EXISTING OSUL SHELFLISTING POLICY

The current call number policy for shelflisting is to review all call numbers both to verify their uniqueness and proper fit in the alphabetical order and to apply local practices.

It is assumed that it is important to keep the call numbers unique. Only strict alphabetical order under main entry on

the shelves is in question and requires study. Local practices should be identified and compared with national standards and practices. If the two differ substantially, then the value of the local practices should be assessed.

Some examples of the differences between local and national practices are listed below.

TRANSLATIONS

Currently, whenever the Library of Congress (LC) does not provide a special scheme for translations, librarians at OSUL follow their own scheme. In the book *Midaq Alley* by Najib Mahfuz, for example, the cutter number for the translation from Arabic to English was changed in the OCLC record from OCLC PJ7846 A46 Z4813 to OSUL PJ7846 A46 Z481.

BIOGRAPHIES AND AUTOBIOGRAPHIES

OSUL policy for items for which LC slides the second cutter is to follow what is already established in the shelflist. In most cases this requires the addition of a third cutter for main entry, but a few places in the shelflist follow LC and use the sliding second cutter. If nothing has yet been established in the shelflist, OSUL policy is to add the third cutter. For example, in class P, where tables VIIIa and IXa apply, OSUL prefers Z5 for autobiography and Z8 for biography and criticism. If there are several autobiographies, Z52, Z53, etc. are used. Z8 is followed by a cutter number for author of the biography or criticism. For example, the cutter number in the OCLC record for a biographical work on James Albert Michener was changed from OCLC PS3525 I19 Z73 to OSUL PS3525 I19 Z8 C5.

In this case the cutter number Z73 in the OCLC record was changed to Z8 with a third cutter, C5, added for the author of the biography.

CRITICISM

It is OSUL practice to add "18" to the cutter number for works of literary criticism. For example, the cutter number of

In Search of Centennial: A Journey with James A. Michener by John Kings was changed from OCLC PS3525 I19 C434 to OSUL PS3525 I19 C418.

SELECTIONS

It is OSUL local practice to add "17" to the cutter number if the book is an author's selected works. For example: the cutter number of the *Selected Works of Henry Louis Mencken* was changed from OCLC PS3524 E43 P912 to OSUL PS3524 E43 P817.

THE STUDY

DISTRIBUTION AND CHARACTERISTICS OF THE SAMPLE

A careful look at the tables of distribution and characteristics of the sample reveals that the sample is representative of the entire population of books cataloged in a year. The sample includes books from all languages, in all location libraries, dates of publication, and sources of cataloging (e.g., LC, member copy, etc.).

ANALYSIS OF THE DATA

As mentioned before, the size of the one-week sample was 1,046 records. The statistics indicate that there were 694 records (66.34%) that fit the shelflist with no adjustment to the cutter number. Two hundred eighty-eight records (27.53%) were adjusted to fit the shelflist alphabetical order, and 64 records (6.11%) were adjusted to fit OSUL local cataloging practices.

In analyzing these data, six questions were addressed on the distribution of changes and additions to the cutter. If the cutter number were no longer adjusted, we wanted to see what particular areas would be affected and what exceptions needed to be considered.

To What Extent Was the Cutter Adjusted in Various Classes and What Was Adjusted?

The range of adjustment in the main entry was between 5% and 55%. In most classes, the cutter was adjusted to fit the shelflist alphabetical order. However in class P,
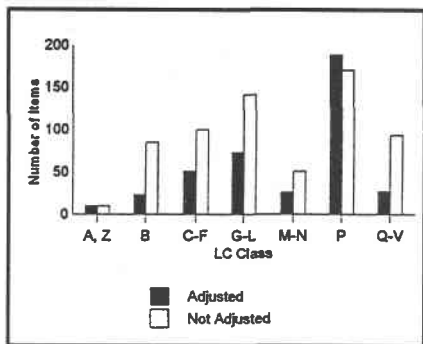
Figure 1. Cutter Adjustment by LC Class

especially PC, PL, PN, PQ, PR, and PS, most of the adjustments occurred because of OSUL local practices. These adjustments follow the OSUL translation tables and add the third cutter, the criticism, or the biography number. There were no major adjustments in the personal, geographical, and topical cutter except in class P, where the above adjustments were made (see figure 1).

To What Extent Was the Cutter Adjusted for Different Languages and What Was Adjusted?

The changes occurred across all languages without focusing on a particular language. The range of changes in the main-entry cutter was from 3% to 55%. Most of the changes were made to follow OSUL local practice. For example, in English-language records, 23% were adjusted to add the translation, third cutter, biography, or criticism number.

In Chinese-language materials, 55% were adjusted because the LC classification was modified frequently. As a result, adjustment was made to group materials together under the same subject headings with the established classification number (personal headings, geographic, and topical headings). Another reason is that for many Chinese materials, the main entry starts with the letters *Ch.* This requires consultation of the shelflist to fit the cutter number. About 50% of the Chinese records required cutter adjustment because they were based on member copy, with various local cutter practices. The

same applied to Japanese-language materials, for which 24% of the records were adjusted to accommodate local practices and proper order.

The remaining cutter changes occurred to fit the shelflist alphabetical order. In terms of geographical and topical cutters, there were no major changes or additions to the cutter number except to fit the shelflist alphabetical order.

For Which Imprint Dates Was the Cutter Adjusted and What Was Adjusted?

Proportionally, older materials (e.g., those printed before 1979) require more adjustment than post-1990 imprints. For example, in materials dated before 1979, adjustments occurred in 43% of the records. In examining these records, we discovered that the majority of them were in English, in class PS, and for the TRI (Theater Research Institute) library. In post-1979 materials, adjustments were made in 57% of the records cataloged in this sample. Most of the adjustments in these records occurred without focusing on particular locations, classes, or languages.

We found that no major changes were made in topical and geographical cutter in any date of imprint (see figure 2).

To What Extent Was the Cutter Adjusted for Different Locations and What Was Adjusted?

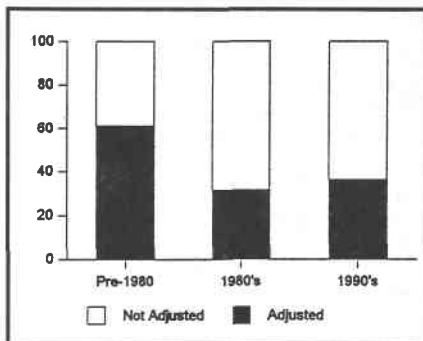Changes in the cutter happened across all location libraries. The range of changes in

Figure 2. Percentage Adjusted by Date of Work

the main cutter was 4% to 80%. Some locations required many changes. For example, changes were made to 80% of records for the books housed in the East Asian Studies, for the reasons stated above.

The second-highest percentage of changes (78%) occurred in records for items located in the TRI library. One reason for these changes is that many items cataloged for TRI are plays, which fall into the literature category, in which the cutter number is frequently adjusted to fit OSUL local practice.

Another reason for frequent cutter changes is the age of materials. Because many of the TRI materials are old and were cataloged much earlier, existing cataloging records call for modification of the cutter number to fit the shelflist order. For example, a cutter number of a play by Mabel Margaret Cowie Clark was changed on the OCLC record from OCLC PR6005 L32 H4 to OSUL PR6005 L36 H4. The reason for changing the author number is that the author number was established earlier at the OSUL shelflist as L36. This practice explains why the percentages of adjusting the cutter number in class PS (47%) in the personal cutter and in the pre-1979 (43%) books were relatively high.

The third-highest percentage of changes occurred in materials for the Map room. One reason is that most of the cutter numbers for map records had single digits; to make room for additional digits, the cutter number was expanded. For example, the cutter number of one map was changed from OCLC G876 L3 to OSUL G876 L34. In this case the cutter number fit the shelflist order, but another digit (4) was added to expand the cutter number for future titles starting with the letter *L*.

In 50% of the books housed in the music library, the cutter number was changed. One reason was that in the past, in addition to the composer number, the cataloging department used another cutter for the title of the book. Shelflisting policy later changed and no longer required use of the second cutter. This had an adverse impact on the shelflisting process, requiring fitting a single cutter into
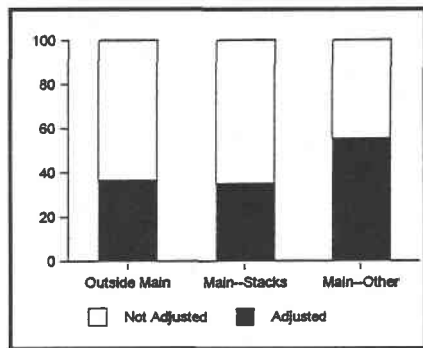
Figure 3. Percentage of Adjustment by Type of Location

a double cutter number. No major changes were needed for the geographic and the topical cutter number (see figure 3).

In Which Record Types Was the Cutter Adjusted and What Was Adjusted?

Record source tables indicate that the most changes in cutter number were made for records supplied by member libraries (29%) followed by records provided by LC (17%). There were no major changes in the geographic and topical cutter number.

To What Extent Was the Cutter Adjusted for Different Record Levels and What Was Adjusted?

There were changes in all record levels, but records that are encoded as levels L (which is a tapeload from RLIN to OCLC) and 7 (which is minimum-level cataloging done by LC) had the most changes in the cutter number (33%). These were done to fit the shelflist order. Changes to records encoded level I (full LC record) were done to follow local practice.

SOME GENERAL OBSERVATIONS AND SUMMARY

In the sample, the cutter numbers in 694 records (66%) were accepted as is. In 288 records (27.53%), the cutter numbers were adjusted to fit the shelflist alphabetical order, and in 64 records (6.11%) the

cutter numbers were adjusted to fit OSUL local practices. The following paragraphs will provide some explanation and examples of two types of change.

Changing Cutter to Fit the Shelflist Order

As mentioned before, adjustments to the cutter numbers occurred in 288 records across class, language, location, and level of cataloging. These cutters were adjusted to keep the books on the shelves in alphabetical order and to facilitate browsing by patrons.

Some examples of changing the cutter to fit the shelflist alphabetical order are:

OCLC	OSUL
LB 2825 B428	LB 2825 B39
LB 2825 B434	LB 2825 B4
LB 2825 B44	LB 2825 B44
LB 2825 B55	LB 2825 B5
LB 2825 B678	LB 2825 B67
LB 2825 B722	LB 2825 B73

These six examples were taken from the shelflist to examine how the cutter number was changed in records and why. In all six, the cutter numbers found in the OCLC records corresponded to those in the shelflist. No adjustments were needed.

Adjusting cutter for alphabetical order does not always produce desired results. Despite the efforts by the cataloging department, strict alphabetical order is not always achieved. Some books are not in order due to changes in the shelflist procedures and limitations of the old online system (LCS) in dealing with complicated cutter numbers (e.g., when the cutter number is more than three digits).

Changing the Cutter Number to Follow OSUL Local Practice

We also examined 64 records in which the cutter numbers were adjusted to fit OSUL local practice. Although OSUL primarily follows LC cataloging practices, it has also established local practices. Some of these were established to transcend the limitations of the old LCS system and are listed in the old LCS manual, while others were established for no discernible reason.

Comparison of OSUL local practice with LC practice indicates that OSUL does not completely follow LC practice. For example, OSUL does not cutter for collected prose works, polyglot language publications, periodicals, society publications, or serials. In cuttering for separate works, autobiography, and general works, OSUL uses its own cutter numbers. In general works, OSUL adds a third cutter for the main entry.

OSUL established its own translation numbers by modifying and expanding the LC cutter numbers. OSUL also expanded the use of the LC translation tables. LC did not expand the translation numbers because in some classification schedules, translations are designated with the caption "By language A to Z" and the date. In these cases, one cutters for the specific language by using .E5 for English, .F7 for French, etc. For example, OSUL changed the cutter number for an English-language translation of Erich Maria Remarque's work from OCLC PT2635 E68 I513 to OSUL PT2635 E68 I51.

In other cases, OSUL has also established another local practice that differs from other libraries, particularly LC. If an item is a part of something or an adaptation, OSUL adds .x17 to the cutter number. If it is a work of criticism, LC adds .x18 to the cutter number. For example, the cutter number for Erich Maria Remarque by Richard Arthur Frida was changed from OCLC PT2635 E68 I5 to OSUL PT2635 E68 I518.

Although the number of records in which the cutter numbers have been adjusted for local practice is very small, it takes much time to determine if the book requires cutter change or addition. It also takes time to alter a number from the cutter to accommodate local practices. Because the LC practice of adapting uniform standards seems to satisfy their users, it seems reasonable to assume that this practice can be employed at the OSU Libraries.

ADDITIONAL INFORMATION FROM OTHER LIBRARIES

Additional information was gathered through an informal survey of other

libraries posted to the AUTOCAT and CIC listservs. The following questions were asked:

- How do you ensure that the call number for each title is unique?
- Do you review every call number to fit the shelflist order, or do you accept call numbers as they are on the bibliographic record?
- If you don't do shelflisting, what is the impact on the access to the book by patrons?

Several librarians responded to the questions. Regarding the first question, one librarian mentioned that he added a digit to the OCLC call number to make it unique; two respondents indicated that they check the shelflist to make each title unique; while four indicated that they accept the call number unchanged.

Regarding the second question, the policy at four libraries is not to review every call number. One library reviews call numbers only for literary works. Two libraries review all books.

Regarding the third question, some librarians indicated that the importance of shelflisting varies from class to class. In literature, for example, alphabetical order is important, whereas in the sciences, date of publication is more important than alphabetical order.

FINAL RECOMMENDATIONS

As a result of the study, the CPAC made the following recommendations:

1. Continue to adjust cutter numbers in class "P," "M," "N" to put new items in online shelflist alphabetical order.
2. In all other cases, accept complete call numbers as they appear on copy
3. Add the date of publication for all materials, if not present in the call number.
4. Recommendations 1–3 address the use of call numbers present in copy. For original cataloging, follow the national standards for creating new records.
5. Duplicate call numbers:
   a. When student shelvers find duplicate call numbers on books in the stacks (or when duplicates are found

at any other point), they should be reported to supervisors, who should send the book with a note to the Cataloging Department to adjust the cutter number.
   b. The Cataloging Department will also pursue other means of examining the rate at which duplicate call numbers occur in order to evaluate the impact of this change, e.g., generating duplicate call numbers report form OSCAR (OSUL's online catalog)
6. The issue of keeping conferences and editions together, by means of call number or cutter number, arose during the course of the study. This issue should be examined by the CPB and CPAC. Recommendations will be discussed with Heads of the Undergraduate and Department Libraries and Main Library Public Service Heads. Also, a separate proposal will be made in regard to Special Collections materials.

The recommendations were submitted to and accepted by the assistant director for technical services.

CONCLUSIONS

The study showed that a large percentage of the adjusted cutters were in classes M, N, and P. Because these are classes in which creative works are systematically ordered by cutter number to achieve effects more complex than mere arrangement by main entry within a specific class, they merit continued monitoring to achieve those special goals. Monitoring and adjusting the cutter number in other classes produces proportionally far fewer changes, and most of those changes merely maintain an already imperfect main entry arrangement within specific classes. The value added to call numbers by continuing to examine cutter numbers for all additions to the collection is insufficient to justify the time and effort required to maintain that practice. Limiting adjustment to classes P, M, and N means that only about two-fifths of added titles need to be examined for possible adjustment. Furthermore, class is an easily applied criterion for culling items for which

further examination of the cutter number is necessary. The time saved on the other three-fifths of additions can be applied more productively to other cataloging activities.

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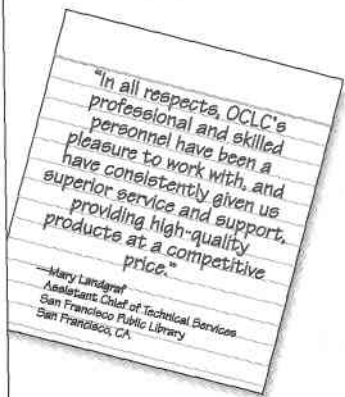
Bibliographic Utilities and Latin American Collections

Ketty Rodríguez

There appears to be a conflict between the principles of cooperation in cataloging and the acquisition of Latin American materials. A recent look at the literature revealed that the availability of copy cataloging for Latin American imprints in the bibliographic utilities seems to be on the decline. The author surveyed large, medium, and small Latin American collections via the Internet to determine the usefulness of bibliographic utilities for cataloging Latin American material. It was found that some large collections use more than one utility. Library representatives said their institutions were using more than one utility because they were trying to receive the maximum benefit from copy cataloging. Some catalogers of Latin American imprints seem unaware of the decline of copy cataloging in the bibliographic utilities that has been documented in the literature.

Cooperation among libraries is one of the most discussed topics in library literature. The drive toward standardization, which paved the way for automation, has been done with the ultimate purpose of enhancing cooperation.

Over time, library cooperation has taken several forms: cooperative acquisitions and collection development, and cooperative cataloging. One of the most successful cooperative efforts in the area of acquisition/collection development was the Farmington Plan (Hendrik 1973), which divided responsibilities for acquisitions among the large research libraries in the United States. The ultimate purpose was to build basic research collections across the country to fulfill research and curriculum needs of faculty and students and at the same time to develop a unique research collection that was based on assigned subject or country responsibility. Because the responsibilities were assigned for a predetermined subject or for a particular country collection, the chances of overlap were greatly reduced. Even after the Farmington Plan was no longer operational, libraries continued to honor their commitments and research collections continued adding library materials in their assigned areas (Grover 1991).

Cooperative cataloging of library material was stimulated by the development of bibliographic networks in the 1970s. The emergence of the OCLC Online Computer Library Center, Inc. (OCLC), the Research Libraries Information Network (RLIN), and the Western Library Network have had a great impact on the library community. From the beginning these bibliographic utilities allowed many libraries to automate their processes and, at the same time, achieve economies of scale.

KETTY RODRÍGUEZ is Assistant Professor, School of Library Science and Information Studies, Texas Woman's University (f_rodriguez@venus.twu.edu). Manuscript received October 13, 1995; revised April 28, 1996; accepted for publication July 2, 1996.

More recently, however, some authors (Avram 1979; Sercan 1994) have questioned the benefits derived from these bibliographic utilities. One author has suggested that because there are different reasons for cooperation in acquisitions, collection development, and cataloging, institutional conflict can arise among them (Grover 1991, 407). For example, the goal of cooperative collection development is that at least one copy of any item of research value must be made available somewhere in the United States. Implicit in this goal is the value of diversity or the uniqueness of library collections. But shared cataloging is based on the principle of taking advantage of the homogeneity, similarity, or overlap in library collections. One of the primary reasons for belonging to a bibliographic utility is to decrease the cost of original cataloging.

In the literature on cataloging Latin American materials, a sentiment has been expressed that the uniqueness of Latin American collections means that they benefit less from bibliographic utilities than other, more standard collections. In fact, a librarian at Cornell University stated that when they started processing material locally in 1988, they stopped including their records in the RLIN database. She wrote: "Now other RLIN libraries are following this route and not entering their acquisition data on the utility" (Sercan 1994, 59). Several authors have written about the loss of autonomy suffered by library management when they subscribe to a bibliographic utility (Martin 1986; Hafter 1986). Often, cataloging departments follow the directions established by the bibliographic utility rather than the individual needs of their own institutions (Hafter 1986). The result is an unwanted loss of autonomy by the library cataloging department, with a subsequent loss in the staff's feeling of professional worth.

The 1970s were characterized by the growth of bibliographic utilities. During that time technology was still very expensive and not nearly as powerful as today. Therefore, bibliographic utilities were indispensable for many libraries interested in automating various processes. But in the 1980s, more powerful and less costly technologies became available, such as CD-ROMs. There has been a spate of local networks made up of carefully selected sister institutions whose online catalogs are accessible to each other. With the growth of the Internet, many libraries are finding that catalogs of other institutions are readily available.

The impact of these developments has not been overlooked by OCLC and RLIN. In a seminar sponsored by OCLC in January 1991, concern was expressed that: "if no data exchange occurs then the resulting isolation of libraries jeopardizes national resources, and consequently effective library services" (Lowell 1991, 100).

The realization by many libraries that there might be various new ways to perform tasks once carried out by bibliographic utilities, plus the drive toward greater homogeneity (Perrault 1994) in academic libraries, tends to bring into question the usefulness of bibliographic utilities for copy cataloging of Latin American imprints. The central questions posed are: (1) Which bibliographic utilities are currently being used by Latin American collections? (2) Is there a pattern of use of these bibliographic utilities? (3) What is the usefulness of the utility in terms of the amount of copy cataloging for Latin American imprints? and (4) What are the possible causes of the decline in the usefulness of bibliographic utilities for the copy cataloging of Latin American materials?

LATIN AMERICAN COLLECTIONS AND THE INFORMATION EXPLOSION

In an environment with an explosion of publications with ever-increasing prices, librarians are struggling to maintain their collections while being confronted with budget cuts, staff reductions, and technological changes. With tax revolts reducing government revenues, and an aging population requiring more of the public resources that remain, universities—perceived as another self-serving bureaucracy—are receiving far less support than in the past. Area study collections that once were the library vanguard are

now seen as relics of an outdated library philosophy that emphasized ownership over access (Hazen 1993, 269). Despite the support received by area studies during the post-war period, area studies were struggling for survival by the 1980s. Area studies flourished in the post-war period, "only to collapse with the advent of peace" (Merkx 1993, 294). Some universities, to save staff and cut costs, have merged the special collections into the general collection. Others have eliminated special language and area catalogers, expecting the cataloging to be obtained through the bibliographic utility (Grover 1991, 407).

In a 1983 study, Grover (1991) searched RLIN and OCLC databases to determine the speed of copy cataloging for 298 Spanish-language Latin American imprints. The researcher found that slightly more than one-third was cataloged during the first six months and only one-twelfth during the last six months. The author found that a year after receiving 298 Spanish-language imprints, 50% of the books had not been cataloged anywhere in the United States. The author also found that there was little difference between the two utilities because both had the same number of books, although not the same books. Sercan (1994) carried out a similar study in 1992 with 783 Latin American Spanish-language imprints. Both studies used similar methodologies, and the purpose was the same: to gauge the speed of copy cataloging. In the more recent study, Sercan spaced the inquiry every four weeks instead of every six months. In this second study, the author found a marked decline in copy cataloging. In each study, the authors found that allowing more time slightly improved the results.

At a time when institutions of higher education should be finding ways to prepare Americans for globalization, proficiency in foreign languages, and cross-cultural skills, the resources to support these goals, have declined. In recent research, Perrault (1994, 187) has revealed that institutions of higher education are buying fewer foreign-language materials. The author compares the nonserials acquired by 72 ARL libraries in 1985 with those

acquired in 1989. The researcher found an overall decline in the total number of nonserial imprints acquired by these libraries. She also noted an alarming decline in foreign-language acquisitions, a decrease in unique titles on subject areas and an increase in the acquisition of core material. The net result of these trends will likely produce more homogeneity and less diversity in library collections. Such results would have serious implications for research and resource sharing.

This shift of attention away from foreign materials and from area studies is further documented in a study (Leazer and Rohdy 1994) on the level and quality of bibliographic control of foreign monographs. In this study, the authors aimed to answer the following questions: To what extent is effective bibliographic control maintained over foreign publications? What proportion of the material is acquired and cataloged? Is the quality of cataloging sufficient? What are the specific quality problems encountered? and Is the material controlled in a timely manner?

After analyzing in depth more than fourteen studies, they conducted a baseline study. The results of their study confirmed (p. 41) "that the differences in treatment of foreign and domestic monographs is real and might even be greater than suggested by previous research. Of special concern is the lack of any control over a significant proportion of foreign research monographs." The quality of the records for foreign monographs was lower than the quality for domestic monographs, but the differences in quality were not as large as the differences in the extent of the coverage.

METHODOLOGY AND DATA ANALYSIS

A survey of Latin American collections, selected by size, was conducted by using the Latin Americanists Librarians Announcements List (LALA_L) on the Internet. LALA_L is a moderated list prepared by Gayle Williams of the Cataloging Department at the University of Georgia Libraries in Athens, Georgia.

For the sake of consistency and comparison, the Latin American collections

TABLE 1

GROUPS OF COLLECTIONS SURVEYED BY DEAL

Group I—190,000 or more	Group II—100,000 to 189,000	Group III—100,000 or less
Cornell	Arizona	Brigham Young
Duke	Arizona State	London
Florida	California San Diego	New York University
Illinois	Massachusetts	Notre Dame
New Mexico	Miami	Ohio State
North Carolina	Minnesota	Pennsylvania State
Pittsburgh	San Diego State	Rutgers
Princeton	Vanderbilt	
Puerto Rico		
Southern California		
Texas		
California		
UCLA		
Yale		
Wisconsin		
Stanford		

included in this study are roughly the same collections used by Deal (1993). A questionnaire consisting of 5 questions was posted on LALA_L on February 22, 1996; a total of 15 responses were received. This represents 50% of the 30 responses received by Deal (1993), which were classified by size into 3 groups.

Group 1 included those libraries with 190,000 volumes or more; Group 2, libraries with 100,000 to 189,000 volumes; and Group 3, libraries with fewer than 100,000 volumes. Nine of the libraries (60%) in Group 1 responded; 4 (50%) from Group 2 responded; and 2 (28%) from Group 3 replied.

The questions were:

1. What bibliographic utility is currently being used to catalog Latin American material? Specify the starting date of the use of the utility.
2. If you have switched to a different bibliographic utility, indicate both utilities, the date of the switch, and the reason for the change.
3. If you are using more than one utility indicate the reason why.

4. Rank the usefulness of each utility. (Use 1 to indicate the most useful and 4 for the least useful.)
5. Indicate the possible causes for the decline in the usefulness of bibliographic utilities for copy cataloging of Latin American imprints. (Use 1 as the most imporant cause and 4 as the least important cause.)
   ___ Decrease of the hit rate
   ___ Decrease of quality
   ___ Too expensive
   ___ Loss of autonomy of administrators
   ___ Alternative resources
   ___ Other

The usage of bibliographic utilities by Latin American collections is shown by library size in tables 2–6. Of the 15 respondents, 14 (93%) use OCLC. Only one uses RLIN exclusively. Three libraries currently use both utilities. The larger collections have switched utilities but the other two groups continue to use the original utility selected. One reason for switching, or in having both utilities, is that the librarian was looking for a higher hit rate, and thus faster processing of Latin Ameri-

TABLE 2

USAGE OF BIBLIOGRAPHIC UTILITIES BY
LARGE COLLECTIONS

Group I	Bibliographic Utility	Dates of Usage
Cornell	OCLC	1973–1981
	RLIN	1981–1988
Duke	OCLC	1980–
Florida	OCLC	1975–
N. Carolina	OCLC	1978–
Puerto Rico	OCLC	1988–
S. California	OCLC	1976–1985
	RLIN	1985–
Texas	OCLC	1974–
UCLA	OCLC	1978–
Yale	OCLC	1974[?]–1977
	RLIN	1977–
	OCLC	1994–

TABLE 3

USAGE OF BIBLIOGRAPHIC UTILITIES BY
MEDIUM SIZE COLLECTIONS

Group II	Bibliographic Utility	Dates of Usage
Miami	OCLC	1978–
Minnesota	OCLC	
San Diego State	OCLC	1977–
California, San Diego	OCLC	

TABLE 4

USAGE OF BIBLIOGRAPHIC UTILITIES BY
SMALL COLLECTIONS

Group III	Bibliographic Utility	Dates of Usage
Brigham Young	RLIN	1978–
London	OCLC	1977–

can imprints. The reasons given by librarians at two libraries using both utilities were "We are trying to get as much copy cataloging as is available" and "We use both because the bibliographic record appears faster in OCLC than RLIN but sometimes we can not find the item in OCLC and we can in RLIN."

Respondents from the largest collections also offered details about their relationships with the utilities. Librarians from Cornell said that since 1988 they have done their cataloging on their local system and that tapes of this work are sent weekly to RLIN. They also noted that they are currently considering the use of FTP (file transfer protocol) for data exchange. Librarians from the University of Southern California commented that although they are using OCLC primarily, they upload records to RLIN on a monthly basis. The librarians at Yale University, who observed that Yale is a founding member of RLG/RLIN, use their local system like Cornell, and upload their records to both OCLC and RLIN. Librarians from the University of North Carolina indicated that 85% of their Latin American collection has been cataloged.

TABLE 5

RANKING OF USEFULNESS OF
BIBLIOGRAPHIC UTILITIES

Utility	Rank	Libraries
OCLC	1	14
OCLC & RLIN	2*	1
RLIN	4	1

*Two libraries used two utilities. One ranked them both as 2. The other one ranked RLIN as 4.

TABLE 6

POSSIBLE CAUSES OF DECLINE IN
USEFULNESS OF UTILITIES

Possible Causes	Rank	Libraries
Decrease of hit rate	1	5
Decrease of quality	2	3
Too expensive		0
Loss of autonomy		0
Alternative resources		0
Other		7

In the "other" category, 6 of the 7 librarians questioned the premise that the usefulness of the utilities has declined. If there has been a decline, they argued, it is probably connected to cut-backs that have limited the number of catalogers hired to do original cataloging. One librarian provided numbers of books cataloged at her institution in 1995 and 1996. For 1995 the cataloging team for Iberia—including Spanish, Catalan, Portuguese, and Gallegan material—and Latin America copy cataloged 6,242 books with copy and 1,390 without copy cataloging. So far in 1996 the same team has cataloged 4,729 books with copy and 905 without copy—this includes about 1,500 new books sent to the backlog. The librarian giving the statistics demurred any comment on the decline because she could not give an accurate number due to the substantial backlog.

CONCLUSIONS

OCLC was utilized by 14 of the 15 Latin American collections. Most of the libraries began to use the utility in the 1970s. Three of the largest collections used both OCLC and RLIN. The librarian for one of those three collections ranked both utilities in the highest category. However, another ranked both utilities in the second category, while the third considered OCLC very useful but ranked RLIN as the least useful.

Two reasons were given by the librarians for the use of both utilities: (1) they wanted to take advantage of as much copy cataloging as possible and (2) OCLC is often faster than RLIN, but they have more success finding the copy cataloging in OCLC than in RLIN.

The data indicate that the growing backlog may be caused by the fact that fewer catalogers are doing original cataloging. At the same time, one can also see from the data that the utilities are being used less and less frequently for copy cataloging, thus exacerbating the growing backlog. If the utility is less useful in providing copy cataloging, then the backlog continues to grow. However, 10 of the 15 (66%) respondents did not agree with the literature cited about the reasons for the decline in copy cataloging. Those who protested claim that they depend heavily on the utilities for copy cataloging and yet the backlog continues to grow.

Five of the respondents (33%) maintain that if there is a decline in quality (which they doubt) it may be due to a decline in the number of hits. Only three respondents (20%) felt that there was a decline in quality. The remainder of those answering mentioned that they do not agree that there is a decline as claimed in the literature.

The comments by the librarians were telling. One asked me to refer her to the studies alleging a decline in the availability of copy cataloging for Latin American imprints. Another librarian agreed that there was an overall decline in buying power, but alleged that her budget had increased due to funding from private sources.

It would appear that due to a growing backlog, perhaps brought about by reduction of staff doing original cataloging, librarians in charge of Latin American collections have been slow to recognize the reduction in the availability of copy cataloging records in the bibliographic utilities. This decline has been documented in the literature concerning Spanish-language material destined for Latin American collections. Many of the librarians in charge of Latin American collections depend heavily on copy cataloging available from the bibliographic utilities. The decline may be due to the use of the utility and the procedure used by the system. If this is the real explanation, then it would also explain the growing numbers of backlogs.

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Thesis and Dissertation Citations as Indicators of Faculty Research Use of University Library Journal Collections

Louise S. Zipp

Citation analysis is a long-standing collection-evaluation tool often undertaken to investigate one aspect of library collection use. Citations from theses and dissertations are much more easily and comprehensively gathered than are citations voluntarily supplied by faculty. Using four studies in geology and biology, the Kendall coefficient of rank correlation tests the degree of association between journals most heavily cited by graduate students and those titles most heavily cited in faculty publications. Positive associations are confirmed in three data sets. Additional descriptive analysis shows that the 40 titles most heavily cited in theses and dissertations consistently contained about 70% of the top 40 titles cited by faculty, including most of the 12–15 top titles. If results are replicated, thesis and dissertation citations can be reliably used as a surrogate for faculty publication citations in evaluations of the research portion of library collection use.

$\mathbf{A}$s research journal prices continue to climb, selectors search for tools that will enable them to understand better the demand on library journal collections. Studies of circulation data and in-library use contribute to our understanding of what parts of a library collection are being used. The link between demand for research materials and use is most easily achieved by direct analysis of the scholarly communications process. Evaluation of the titles used in the process of discovery or problem identification yields valuable information. The titles in which researchers publish and those titles that they cite in their works also serve to elucidate real and potential demand on library collections.

Citation analysis as a surrogate for use has served to identify journals for selection, de-selection, or off-site storage (Kelland and Young 1994). In research universities, faculty tend to be the most stable and vocal parties using research library materials. By using locally-derived data, analysis of journal titles cited by this known clientele has been valued as a means to measure demand (Crotteau 1991; Haas and Lee 1991; McCain and

Bobick 1981; Noga, Derksen, and Haner 1994; Walcott 1994b; Wible 1990; Zipp 1995). In these studies, however, the faculty whose publications were examined represented small, discrete research groups. Dykeman (1994) measured the ability of the Georgia Tech library to support research in all scientific disciplines. Instead of direct solicitation of faculty or use of department-generated lists, she searched INSPEC to discover faculty publications. Swigger and Wilkes (1991) used data from the Institute for Scientific Information (ISI) to discover references cited by authors affiliated with Texas Women's University. In some studies where the target population is smaller and more discipline-specific, the ease of identifying faculty citations from ISI products still outweighed the limitations of database coverage (Greene 1993; Schmidt, Davis, and Jahr 1994; Williams 1990).

Graduate students conduct research as part of a program of study that results in an advanced degree. Walcott (1994a) observed that graduate students were the most active serials users in the Biology Library at State University of New York at Stony Brook. She analyzed thesis and dissertation citations to determine the most useful serial titles to that group, and she wondered why most citation studies ignore this crucial element of research library clientele. In fact, a few studies have examined this segment of research use (Chambers and Healey 1973; Herubel 1991; McCain and Bobick 1981; Noga, Derksen, and Haner 1994; Peritz and Sor 1990; Sylvia and Lesher 1995; Walcott 1991; Zipp 1995). Thomas (1993) used this approach to study use by the only research clientele at a teaching institution.

While graduate students are a transient population, their research interests, to some extent, reflect those of their faculty advisors. The product of graduate students' research is deposited in libraries and often indexed in general or thematic sources, such as Dissertation Abstracts International and GeoRef. Institution-specific studies of thesis and dissertation citations can use a full population or truly random sample of data, since the source documents can be identified and re-trieved without involving the authors themselves.

Academic scientists in physics, chemistry, biology, mathematics, and geology depend primarily upon library subscriptions or their colleagues' personal subscriptions for retrieval of journal articles they subsequently cite (Hallmark 1994). Graduate students do not tend to have a network in place to make effective use of colleagues for discovery or retrieval of publications relevant to their research. Because they are more dependent upon library collections than are faculty, citation analysis of graduate student research may provide a more accurate snapshot of collection use.

In 1994, I undertook a comparative study to discover geology graduate student and faculty research journal use at the three state universities in Iowa (Zipp 1995). I was easily able to compile thesis and dissertation citations for a three-year period, but I encountered problems compiling even a representative sample of faculty citations. There were no institutional lists of faculty publications, and GeoRef, the primary index for geology, was known to be selective and delayed in its coverage. Given also that the earth sciences literature was not well represented in ISI products, I contacted faculty directly and requested information on their publications released from 1991–1993.

Schmidt, Davis, and Jahr (1994) suggested that faculty journal citations may be assumed also to represent graduate student use. McCain and Bobick (1981) had noted similarities among journal titles most cited in faculty publications and dissertations. They cautioned that data from dissertation citations, without considering those from faculty publications or Ph.D. qualifying briefs, were inadequate to determine the scope of research journal use. Noga, Derksen, and Haner (1994) observed that thesis and dissertation citations and faculty citations could not be used to predict each other. Given the value and viability of analysis of local data as a tool for refining library research journal collections, it is important to examine the strength of the relationship between these two measures of use. The purpose of this research is to determine to what degree graduate student research use of

journal collections can be expected to also represent faculty research use.

METHODOLOGY

To reduce the gaps in faculty citation coverage, described in Zipp (1995), I re-solicited nonresponsive geology faculty in underrepresented subdisciplinary areas. While this follow-up was somewhat successful, it was also necessary to search GeoRef for publications by faculty who never responded. Some coverage was eventually achieved for all subdisciplinary areas, except earth science education. 2,127 faculty journal citations were compiled, and 1,208 journal citations were found in theses and dissertations. The two sets of forty journal titles most frequently cited by faculty and graduate students were combined into a sample of 52 titles (table 1).

A test of rank correlation was applied to reveal any comparability of the relative value of titles to each user group. The Kendall coefficient of rank correlation, Kendall's τ, represents the net proportion of concordant pairs in a sample, from which the proportion of discordant pairs has been removed (Gibbons 1993). The test is appropriate for samples with numerous ties. The titles were ranked, and the test was applied as described in Sokal and Rohlf (1995), including the use of correction factors for ties.

Few recent citation studies compare graduate student and faculty citations, and none use the Kendall coefficient of rank correlation to test the strength of a relationship. To provide a context for interpretation of my findings, I applied the test to three sets of published data, two in the geological sciences and one in biology. Collectively, these results can establish a baseline for subsequent use of this test in citation analysis.

THE STANFORD AND UCLA STUDIES

Use studies were done at the UCLA Geology/Geophysics Library and the Stanford Branner Earth Sciences Library (Noga, Derksen, and Haner 1994). As part of the study, geology theses and disserta-

tions for 1990 and 1991 deposited at each university, as well as a few more to complete subject coverage, were analyzed for citations to journals and monographic series held at each respective library. Stanford theses and dissertations yielded 7,652 citations, and UCLA sources yielded 2,893 citations. At Stanford, bibliographies of faculty publications from 1991 were analyzed for citations to journals and monographic series. At UCLA, faculty publications were analyzed for both 1990 and 1991. The Stanford faculty sample contained 3,460 citations, and the UCLA sample included 1,402 citations. I analyzed the data from each institution separately because of the quantity and reliability of information. In both cases, the same methodology devised for analysis of the Iowa citations was also used. The combined Stanford sample of the forty most heavily cited titles by both groups actually included 52 titles. The combined UCLA sample contained 56 titles.

THE TEMPLE STUDY

An earlier study in the biological sciences provided 1,793 journal citations from faculty publications and 632 citations from dissertations (McCain and Bobick 1981). The authors had analyzed Ph.D. qualifying briefs, dissertations, and scholarly publications of full-time faculty in the Temple University Department of Biology for 1975–1977. From the authors' table of the most highly cited titles, I extracted a combined sample of dissertation and faculty citations using the same methodology as employed with the Iowa analysis. The combined sample consisted of 60 titles.

RESULTS

For the Iowa data, a Kendall's τ of 0.3415654 was calculated. The range of possible values for τ is -1.0 to +1.0, representing a perfect negative relationship and a perfect positive relationship, respectively; a τ-value of 0 signifies no relationship. According to Gibbons (1993), a τ-value is not comparable to the more commonly used r_s-value of the Pear-

TABLE 1

Journals Most Heavily Cited by Iowa Geology Authors

Journal Title	Thesis and Dissertation Citations	Faculty Citations
Geological Society of America Bulletin	80	121
Journal of Paleontology	62	133
Journal of Sedimentary Petrology	62	89
American Association of Petroleum Geologists Bulletin	56	65
Geochimica et Cosmochimica Acta	48	64
Economic Geology	41	28
Journal of Geology	38	22
Soil Science Society of America Journal	38	11
Abstracts with Programs—Geological Society of America	36	116
Ground Water	33	23
Journal of Geophysical Research: JGR	32	67
Journal of the Iowa Academy of Science: JIAS	32	59
Contributions to Mineralogy and Petrology	30	60
Geology	30	88
Science	30	49
American Mineralogist	24	47
Geoderma	24	0
Earth and Planetary Science Letters	21	66
Journal of Hydrology	21	15
Nature	20	46
Paleobiology	20	14
Water Resources Research	19	73
Canadian Journal of Earth Sciences	18	26
Soil Science	18	3
Bulletin of the Centre of Excellence in Geology	15	0
Quaternary Research	13	29
Journal of the Geological Society, London	12	27
Lethaia	12	0

TABLE 1 (continued)

Journal Title	Thesis and Dissertation Citations	Faculty Citations
Sedimentology	12	28
Journal of Ecology	11	3
Bulletin of Marine Science	10	7
Canadian Geotechnical Journal	10	4
Eos	10	28
Marine Ecology Progress Series	10	0
Marine Biology	9	4
Philosophical Transactions of the Royal Society of London	8	9
Restoration and Management Notes	8	0
Tectonophysics	8	11
Coral Reefs	7	4
Tectonics	7	20
Journal of Metamorphic Geology	6	10
Chemical Geology	5	15
Journal of Petrology	5	32
Ecology	4	14
Geological Magazine	4	16
Precambrian Research	4	17
Canadian Mineralogist	3	10
Journal of Environmental Quality	3	16
American Journal of Science	0	45
Geophysical Research Letters	0	14
Journal of Structural Geology	0	11
Mineralogical Magazine	0	19

son product-moment correlation coefficient, whose value tends to fall farther from zero.

Because the τ distribution approaches normality with sample sizes greater than 30, a z-statistic of 3.57 was calculated (Sokal and Rohlf 1995). Using a one-tailed test, the probability of finding a τ of 0.3415654 is 0.0002, which is significant at a 5% confidence level. Thus, the null hypothesis of no relationship between the variables can be rejected. The alternate hypothesis of a positive relationship cannot be ruled out (table 2).

Kendall's τ for the Stanford data is 0.2250267, and the P-value is 0.0091, supporting a positive relationship between the variables, although the relationship is weaker than in the Iowa case (table 2). Kendall's τ for the UCLA data is 0.1080369, which, although positive, did not lead to a P-value large enough to reject the null hypothesis (table 2). The Temple analysis yielded a Kendall's τ of 0.3425445, which is high enough to infer a positive relationship between the two variables (table 2).

While the range of variability in these

TABLE 2

RESULTS OF TEST FOR ASSOCIATION

Study	Subject	Sample Size	τ–Value	P-Value
Iowa	geology	52	0.3415654	0.0002
Stanford (Noga, Derksen, and Haner 1994)	geology	52	0.2250267	0.0091
UCLA (Noga, Derksen, and Haner 1994)	geology	56	0.1080369	0.119
Temple (McCain and Bobick 1981)	biology	60	0.3425445	0.00003

findings was unexpected, it is important to note that the Iowa and Temple studies only considered journals, whereas the Stanford and UCLA studies also incorporated monographic series, including open-file reports and map series. Although these formats were important to the goals of the original studies, they may have diluted the effect of journals in these samples.

Even though the test has confirmed the relationship that most selectors would have already assumed, the lack of comparable published data does not quite answer the original question. Doing so requires a more descriptive interpretation of the original ranked lists set into a context of possible uses.

In most research university libraries, marginal subscriptions were canceled long ago, and new subscriptions are not often placed without evidence of local demand. Document delivery, interlibrary loan, or non-library sources are expected to supply clientele with articles published in more specialized journals. Selectors are more likely to need lists of core journals, to ensure protection of those titles, usually for a designated clientele. To this end, how effectively does research use by graduate students predict research use by faculty?

The four data sets used for the statistical test were reexamined to provide a descriptive measure of the extent that one variable might predict the other (table 3).

The ten titles most frequently cited in theses and dissertations did not effectively predict the ten titles most heavily cited by faculty. Somewhat more surprising is the consistency with which the top 40 titles used by graduate students predicted the top 40 titles used in faculty publications. Amplifying the strength of this association is the fact that the 40 titles most heavily cited by graduate students included nearly all of the top 12–15 titles most cited by faculty.

CONCLUSION

Journal citations in theses and dissertations are better indicators of faculty use than has been previously assumed. A test for rank correlation showed that three of four investigations confirmed similar relative value for the same titles. To validate this conclusion and provide a basis for comparison, more data sets must be tested with a statistical measure of rank correlation. As the strength of this association is defined, the value of this approach for prediction must be further investigated. A less informative, but more striking, descriptive analysis showed that in all investigations about 70% of the faculty's 40 most cited titles were among the 40 cited most heavily by graduate students. This result also needs further examination.

Citation analysis remains a respected technique of collection evaluation. It requires time and diligence, coupled with

TABLE 3

RESULTS OF PREDICTION ANALYSIS

Study	% of Top 10 Faculty Titles Appearing in Top 10 Thesis/Dissertation Titles	% of Top 40 Faculty Titles Appearing in Top 40 Thesis/Dissertation Titles	% of Top 12–15 Faculty Titles Appearing in Top 40 Thesis/Dissertation Titles
Iowa	60	70	100 (of top 15)
Stanford	50	71	100 (of top 12)
UCLA	42	69	75 (of top 12)
Temple	70	70	93 (of top 15)

consistency and good data-handling skills. By choosing a method of data acquisition that avoids voluntary submission, researchers can actually gather a true population of citations. The most heavily cited journal titles in theses and dissertations can be used as a surrogate for the titles most heavily used by faculty in their publications. When appropriate sample sizes are considered, selectors can develop core lists of journals critical to local users and fully representative of the research portion of collection use.

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Notes on Operations

Using Verbal Reports to Understand Cataloging Expertise: Two Cases

Ling Hwey Jeng

The author discusses the use of verbal reports in protocol analysis to study the quality of cataloging knowledge and skills. The author begins with a discussion of the literature on expertise and on the use of verbal reports and protocol analysis in general, and proceeds to present two examples of the use of verbal reports collected as part of a research project on cataloging expertise. Using findings derived from the verbal reports, the author illustrates the process of hypothesis generation for further research.

Who are expert catalogers? What does it take to become one? How do they gain their expertise in cataloging? What is the best way to transfer their knowledge to beginning catalogers so that beginning catalogers can be better trained in a shorter time? In this age of artificial intelligence and expert systems, what knowledge and heuristics should a cataloging system possess to perform like an intelligent human cataloger? These questions focus on two quality-related terms commonly heard among catalogers: *professional* and *expert*. Although not universally agreed upon, the term *expert* in cataloging is usually used to describe a cataloger possessing some combination of experience, knowledge of a special type of material, special language skill, and affiliation with a prestigious library institution. Conventional wisdom such as this helps only to distinguish noncatalogers from catalogers at a very superficial level; it is not meaningful in answering the above questions at any specific level. Although the potential for expert system applications in cataloging has long been recognized (Ercegovac 1984), the recent development of cataloging expert systems (e.g., Davies and James 1984; Hjerppe, et al. 1985; Ercegovac and Borko 1992) provides little practicality beyond prototyping and demonstration (Fenly 1990). The major obstacle to the success of expert

systems for cataloging remains in the unknowns of the knowledge base—that is, cataloging expertise (Davies 1992; Hjerppe and Olander 1989; Meador and Wittig 1991; Jeng 1992; Abrera and Shaw 1992; Jeng and Weiss 1994). This paper describes the use of protocol analysis and its resulting verbal reports to study the general strategies, mental models, and problem-solving methods among expert catalogers.

EXPERTISE

To understand what experts do in cataloging, it is necessary to begin with an understanding of what expertise is in the context of a profession. The *Random House Dictionary* defines *expertise* as "a high degree of skills, dexterity or knowledge of a specific subject area." Johnson et al. (1988) say that expertise is a kind of operational knowledge, "characterized by generativity, or the ability to act in new situations, or the capacity to achieve problem solutions." In problem solving such as that found in most professional tasks, expertise is basically a set of requirements that must be satisfied in order to solve problems in a given domain. Literature shows that experts behave differently from nonexperts. La-

France (1989) describes the characteristics of experts' behaviors and how they differ from those of novices. He divides the characteristics into three areas: general knowledge, problem-solving skills, and memory structure (see table 1).

It is believed that experts recognize more complexity and can attend to multiple cues at one time. Furthermore, they know that the importance of some features is contingent on whether or not other features are also present (Johnson et al. 1981). Experts not only know how to recognize the relevant elements in their problem domains but also know how the elements interact and vary with context.

The approaches to problem solving used by experts and novices are different. Studies show that expert chess players recall move sequences in terms of attack and defense strategies (i.e., schema-driven), whereas novices recall them in terms of spacial position (i.e., data-driven). Experts often conduct qualitative analyses of problems and categorize the problems into recognizable types; novices link specific features of problems with specific solutions. Experts focus more on overall goals, while novices focus more on effects. For example, observations suggest that expert basketball players focus on their goal or plan rather than specific events or event sequences. Novices have limited

TABLE 1

LaFRANCE'S COMPARISON OF EXPERT AND NOVICE KNOWLEDGE CHARACTERISTICS

	Expert	Novice
Knowledge		
Quantity	more	less
Quality	complex	simple
Problem solving		
Approach	schema-driven	data-driven
Analysis	problems	solution
Focus	goals	effects
Speed	automatic	conscious
Memory		
Structure	clustered	local position
Organization	high level	surface features
Experience	episodic	semantic

ability to generate inferences and relations that are not explicitly provided.

Speed is another characteristic that distinguishes experts from novices in problem solving. Expert bridge players are like robots. They have great difficulty adapting to the game when changes are made in the rules, especially when the changes are extensive. Novices' performance is less drastically affected by rule changes. Experts' knowledge structures are so committed to memory and so attached to particular strategies that disrupting them causes their entire problem-solving process to be thrown into disarray.

Experts tend to organize their memories by looking for meaningful relations among smaller units and grouping them into larger chucks (Charness 1976; Chase and Simon 1973). In a study of architectural expertise, Akin (1980) found that expert architects recall building plans at several levels, beginning with local patterns (wall segments and doors), then rooms, then clusters of rooms. Experts also rely on a higher level of abstraction in their memory organization. For example, when asked to replicate drawings, expert electronic technicians do so according to the functional nature of the components of a circuit, such as amplifiers, rectifiers, and filters. Novice technicians however, produce copies based more on the spatial proximity of the presented elements (Egan and Schwartz 1979).

The quality of memorized experience is also different between experts and novices. Novices tend to form semantic memory, which is the knowledge of facts, hierarchically arranged. Experts, on the other hand, have good episodic memory, i.e., the knowledge of situations constructed from experience. Episodic memory records and organizes events such that domain concepts are related to each other according to their concurrence in the same episode. Experts are also able to organize individual episodes into generalized abstract situations in their memory (Kolodner 1983).

While LaFrance addresses the differences between experts and novices in general, authors of other studies attempt to address the process of acquiring expertise

in particular subject areas. Benner (1984), for example, devotes several chapters to a discussion of various levels of knowledge from novice to expert and how a novice becomes an expert in clinical nursing. She identifies five levels of expertise in nursing:

Stage 1 is called the Novice level. At this stage, nurses are taught about situations in terms of objective attributes and features of their task world that can be recognized without situational experience, as well as context-free rules to guide action with respect to different attributes. The rule-governed behaviors of novice nurses are extremely limited and inflexible. They have little understanding of the contextual meaning of textbook terms.

At stage 2, the Advanced Beginner level, the nurses demonstrate marginally acceptable performance. Having coped with enough real situations, they are now able to note the recurring meaningful situational components, also called aspects of the situation.

Nurses are said to have acquired the knowledge of stage 3, the Competent level, typically after they have been on the job in similar situations for 2 to 3 years. They begin to see actions in terms of long-range goals and perspectives, and are able to plan their action or solution based on considerable conscious, abstract, analytic contemplation of the problem. Although at this stage the nurses still lack the speed and flexibility of experts, they do have a feeling of mastery and the ability to cope with contingencies of clinical nursing.

At stage 4, the Proficient level, nurses are able to perceive situations as wholes in terms of long-term goals rather than as individual aspects. They can recognize when the expected normal picture does not materialize and possess holistic understanding that helps decision making.

When the nurses reach the highest level of knowledge—stage 5, the Expert level—they no longer rely on a single analytic principle (rule, etc.) or their understanding of the situation to actions. They now have an intuitive grasp of each situation and zero in on the accurate region of the problem without wasteful consideration of a large range of unfruitful, alternative diagnoses and solutions.

KNOWLEDGE ACQUISITION

Studies of learning and knowledge acquisition processes abound in cognitive and educational psychology. Knowledge acquisition has also been a topic of interest among researchers in library and information science (LIS) during the past decade. Richardson gives an overview of the techniques for knowledge acquisition appropriate for LIS in his discussion of knowledge-based systems in general reference work (1995). Ercegovac (1992) provides an empirical study of knowledge acquisition specifically applied to the interpretation of authorship of cartographic materials in map cataloging. In her study, she uses three elicitation methods, including one unobtrusive and two obtrusive measures. The obtrusive methods involve a face-to-face open interview and a one-page, paper-and-pencil, forced-format questionnaire. The unobtrusive measure consists of a content analysis of a sample of 499 machine-readable cartographic entries.

Other researchers concentrate their studies on the process of acquiring specific skills. For example, Cooper (1991) discusses user skill acquisition in office information systems during a three-year study designed to evaluate users' abilities to utilize functions and features of an information system. Hoffman (1989) provides a survey of methods used by researchers for eliciting expert knowledge. He places the typical methods of expert knowledge elicitation into three categories: (1) observation of familiar tasks; (2) unstructured, free-flowing interviews; and (3) protocol analysis of special tasks.

VERBAL REPORTS OF PROTOCOL ANALYSIS

The use of protocol analysis can be traced to the beginning of this century (Erickson and Simon 1985). Protocol analysis is the process of analyzing the work situation (i.e., a protocol) of a subject (whether an expert or a learner) in order to understand the procedures, knowledge, or skills involved. To allow ample time for analysis and to avoid missing spe-

cifics in the process, the subject is often asked to perform routine work (such as cataloging a book), in which the work situation is recorded. The protocol can be recorded via audiotape, videotape, or written notes.

Protocol analysis has been used as a method in expertise studies in the areas of instructional design (Rowland 1992), general problem solving (Saiz and Breuleux 1992), and writing (Smagorinsky 1991). Protocol analysis is used not only for understanding humans but also for the knowledge acquisition process in building expert systems. Martin and Redmond (1989) show the potential of automatic knowledge acquisition in diagnostic domains by coding expert protocols into machine-readable form in a diagnostic system. The system uses the expert's knowledge to solve similar problems that occur in the future and also to apply newly learned information to novel but similar cases. Protocol analysis has also been used in studies of LIS (for example, see Belkin and Brooks 1987; Saracevic 1989). Recently Thomas (1993) used a think-aloud protocol in a qualitative study of novice users to study the user interface of ERIC on the Macintosh

Verbal reports are a tool commonly used in protocol analysis. Subjects are asked to verbalize their activities while performing a particular task. The subject may be asked to describe the process as it occurs or to "think aloud" in work situations involving problem solving or decision making. The interviewer remains silent in the background during protocol recording and only speaks out occasionally to prompt the subject for further explanations. The use of verbal reports through think-aloud methods is explained in detail by van Someren et al. (1994), who describe the think-aloud method as a "very direct method to gain insight in the knowledge and methods of human problem-solving." Verbal reports can also provide information about both sophisticated and general mental processes that are difficult to obtain by other research methods. Verbal reports are especially useful, according to van Someren et al., in investigating differences in problem-solving abilities

among people, differences in difficulty among tasks, effects of instruction, and other factors that have an effect on problem solving.

The use of verbal reports has some limitations. Even within normal work settings, verbal reports are an obtrusive tool for studying learning behaviors. As with other obtrusive research methods, subjects under study using verbal reports are fully aware of research objectives. With the outcome in mind, some subjects may try to please the researchers, although Norris (1990) concludes in his study that the obtrusiveness does not alter subjects' thinking and performance. Verbal reports are used for direct recording of the thinking and reasoning process, and are different from the "secondary elaboration" method often used to study memory recall (Elmes and Bjork 1975).

The use of verbal reports has proved valuable in studies of learning and knowledge acquisition in spite of their limitations. For example, Schael and Dionne (1991) conclude that a subject's lack of familiarity with the technique of protocol analysis does not affect his or her ability to participate in the protocol analysis.

CATALOGING KNOWLEDGE BASE

Cataloging is the process of creating surrogates for documents and other bibliographic items, which involves two basic functions: description and summarization (Jeng 1993). In the description process, the cataloger describes the physical attributes of the item and determines useful access points to the item. In summarization, the cataloger attempts to summarize the intellectual content of the item by giving it one or more subject headings and by assigning it a classification number to represent the aboutness of the intellectual content and position the item in the conceptual map of the collection.

To fulfill Cutter's objects and to facilitate end-user retrieval (Cutter 1904), the system of surrogates must allow known-item searching, category searching, and selection among items. Three kinds of knowledge enable catalogers to achieve these objectives: (1) knowledge about the item itself (both bibliographical and subject knowledge), (2) knowledge about users, and (3) knowledge about the desired surrogate as the end product. To ensure end-user searchability and predictability, catalogers must also be aware of another objective in the cataloging process, that is, to maintain the integrity of the system (Malinconico 1974). In order to maintain system integrity, catalogers need two other kinds of knowledge: (4) knowledge about system configuration, and (5) knowledge about how to provide consistency in the process of creating surrogates, i.e., knowledge about tools and rules used for record production and authority control. The objectives of facilitating end-user retrieval and maintaining system integrity represent two very different perspectives in library cataloging; both must be taken into account when mapping the cataloging knowledge base.

The five categories of cataloging knowledge, recognized as basic components of the cataloging knowledge base (Jeng and Weiss 1994), have been dealt with unevenly in studies on cataloging education and training. A cursory examination of cataloging literature suggests a common belief that there are two stages of knowledge acquisition in cataloging: the education the cataloger receives in an LIS program, and experience in the practice of cataloging. It is commonly held that cataloging education is inadequate in shaping cataloging expertise (Avram 1989). There is little evidence in the literature as to what knowledge catalogers acquire in formal schooling and what knowledge they acquire in practice. Fitzgerald (1989), in a case report of cataloging training at Harvard, points out four practical goals for his training program: (a) to bring catalogers "to an appreciation and mastery of the complexity [of bibliographic records] in the most expeditious way while contributing to the accomplishment of the Department's production goals for the year"; (b) to "teach the creation of bibliographic and authority records and file maintenance"; (c) to "develop the habit of research in the cataloger"; and (d) to have students "learn to understand the meaning of rule-governed creativity."

However, little is said in his paper about what knowledge enables the cataloger to reach these goals. A recent ALA committee document enumerating essential elements of training programs for entry-level professional catalogers places heavy emphasis on system configurations and cataloging rules yet deals very little with other categories of cataloging knowledge (Association for Library Collection and Technical Services . . . 1994). A search beyond the area of cataloging education and training reveals a handful of studies on expert performance in subject analysis and indexing. These constitute two groups. The first group concerns the issues of consistency in indexing performance (Markey 1984; Chan 1989; Sievert and Andrews 1991; Giral and Taylor 1993). Most of the studies found significant inconsistencies in assigning indexing terms or subject headings and document the effects of such inconsistencies on information retrieval. None of the studies, however, goes further to investigate the causes of and possible knowledge discrepancies behind the inconsistencies. The other group focuses on the economic aspect of the process, such as time or cost involved in cataloging and indexing (Line 1969; Reynolds 1975; Kautto 1992). For example, according to Kautto, catalogers spend equal amounts of time in analyzing a document and assigning indexing terms to a document.

DATA COLLECTION

In an attempt to study the quality of cataloging expertise and knowledge base, a project was conducted in which the author analyzed the cataloging process and knowledge used by expert catalogers at the Library of Congress (LC). The goal of the project, titled Project Cataloging Expertise, was to identify individual and organizational factors that contribute to the establishment of cataloging expertise. More specifically, the project attempted to answer the following research questions:

- What are the knowledge and qualifications possessed by expert catalogers?

- What are the major tasks involved in cataloging?
- What skills do catalogers exhibit in the process of cataloging?
- What strategies and patterns do expert catalogers use in cataloging?
- What are the specific problems of cataloging training?

PROJECT ACTIVITIES

To collect data for the project, the author spent a total of 15 weeks at the Library of Congress under the sponsorship of LC's Visiting Research in Cataloging Program. Activities during the duration of her research residency included:

- a questionnaire survey, which involved the design of a questionnaire and sample selection, the distribution of questionnaires, and follow-up for nonreturns;
- a verbal report exercise, in which volunteers were asked to keep verbal reports of their cataloging cases according to written instructions given by the author;
- verbal protocol recording, in which the author met with selected senior cataloger volunteers during a typical cataloging session in which the catalogers were asked to think aloud as they cataloged and which the author recorded and documented with notes; and
- observation, in which the author participated in an one-on-one training process in order to observe the experts' cataloging environment (see table 2).

Only two methods, the protocol interview and the verbal report exercise, are described here to limit the scope of this paper.

RESEARCH METHODOLOGY

PROTOCOL INTERVIEW

Initial interviews were conducted with division heads to gather information and provide orientation. These interviews helped the author plan the protocol analysis in two phases: protocol interviews and

TABLE 2
ACTIVITIES OF PROJECT
CATALOGING EXPERTISE

Weeks 1–7	Questionnaire Survey
Weeks 5–11	Verbal Report Exercise
Weeks 9–15	Verbal Protocol Recording
Weeks 7–15	Observation

a verbal report exercise. For the protocol interviews, expert catalogers with professional job rankings were invited to participate in an interview in which they were asked to conduct a regular work situation (i.e., to catalog two items) and to document the process by thinking aloud. The protocols of their cataloging work were recorded.

VERBAL REPORT EXERCISE

A second form of protocol analysis was also given to those expert catalogers who preferred not to be interviewed. They were asked to complete a self-administered verbal report exercise. Each cataloger was given specific instructions and asked to catalog a typical item. The cataloger submitted a verbal report detailing the step-by-step process of problem solving and decision making in the cataloging case.

VOLUNTARY PARTICIPATION

Because of the obtrusive nature of the research method and the large amount of time involved, participants were selected for the project on a voluntary basis. A letter was sent to every cataloger with professional rank (GS-11 or above) in 41 cataloging teams (reaching a total of 367 professional catalogers) asking for volunteers to participate in protocol analysis. Fifty-eight positive responses (15.8%) were received. Twenty-one protocol interview sessions were conducted, and 24 verbal reports were received from catalogers who participated in a self-administered

verbal report exercise. Seventy-three bibliographic records and 49 authority records were created or modified during this project.

Content analysis was the primary method used in analyzing the data collected. The emphasis of data analysis was on (a) finding the general strategies used by expert catalogers so as to identify the mental models used during the process, (b) problem identification, and (c) discovering other issues encountered by the expert catalogers in the cataloging process. The rest of this paper demonstrates how verbal reports were used to collect information on cataloging tasks and presents some preliminary findings of the project.

WHAT'S IN VERBAL REPORTS

Two verbal reports are given here to exemplify the use of verbal reports and how they can provide a glimpse into the mental processes of experts. They capture a typical amount of complexity encountered by expert catalogers in the course of this study. For the purpose of this paper, the first cataloger is assigned the random numerical code 165 and is described as female, while the second is assigned 606 and described as male.

ANALYSIS OF A SELF-ADMINISTERED VERBAL REPORT

The first verbal report by Expert 165 was conducted as a self-administered verbal report that describes the steps involved in the process of descriptive cataloging for one item (the coded original report is given in figure 1). What story does this verbal report tell? For one thing, Expert 165 is a descriptive cataloger who performs only descriptive cataloging on her job. The verbal report itself does not describe the context in which the protocol occurred. However, observations of the routine process of descriptive cataloging at LC during this project helped the author establish the setting for this case. As in most cataloging settings at LC, Expert 165 chooses a book with the anticipation of finding not only the book but also a printout of the preliminary descriptive

(1) Any special information on slips stuck in book?
(2) No
(3) Is a personal author metioned somewhere
(4) (Not on t.p.)
(5) No
(6) Title on cover
(7) but no note,
(8) as not different proper.
(9) Ned. Economics Research Group established?
(10) Yes
(11) What is "conducted for: master report"?
(12) Leave as is
(13) Make a.e. for "contemporary pediatrics"?
(14) (a serial)
(15) Yes
(16) Begin on-line work,
(17) working from top of screen to bottom
(18) Add code & date to 955
(19) Proofread 245
(20) nothing to add or change
(21) 260 ..
(22) 300 doublecheck "leaves,"
(23) not "pages"
(24) no no. prelim. p.
(25) Add a.e.s
(26) Look at Fixed fields,
(27) checking esp. boxes 20, 21, 23
(28) Big Question.
(29) Is there one big title or title plus subtitle?
(30) I decide to leave as is & choose latter.

Figure 1. Coded Original Script of Verbal Report by Expert 165

cataloging record created by a preliminary cataloger in another division, and possibly a slip indicating any problems the preliminary cataloger has identified but is not authorized to solve. The expert works at a computer workstation with all the necessary descriptive cataloging tools, such as the *Anglo-American Cataloguing Rules*, second edition (*AACR2*) and LC's *Descriptive Cataloging Manuals*. These are standard tools on each cataloger's desk and are consulted by the cataloger when specific questions arise.

Expert 165 began her work on this book by checking whether the preliminary cataloger indicated any problem that needed her attention before she proceeded; this is typically noted on a special slip stuck in the book. Not finding any such slip, she proceeded to examine the title page. The question in Step 3 was very likely triggered by the potential application of *AACR2* rule 21.1B1, 21.4A and 21.4B, in which the cataloger is to determine if there is a corporate body involved on the title page. The action, in turn, is probably triggered by her noticing a corporate body on the title page, although this was not documented in the verbal report. The answer in Step 4 shows that she did not find a personal name on the title page. This answer in Step 4 triggered the decision made in Step 8.

Instead of continuing the process of establishing the Statement of Responsibilities, Expert 165 at this point decided to keep her attention on the bibliographic data on the title page. She compared the title on the cover with that on the title page. She immediately decided that there

was no need to create a note. This was based on the *AACR2* rules governing use of notes to indicate a different cover title if one exists; Step 8 gives an explanation of *AACR2*, rule 2.7B4. Step 9 indicates another decision point triggered by LC's policy of establishing an authority record in the LC authority file for each corporate body encountered. A search into the LC Name Authority File (LCNAF) was conducted before the decision in Step 10 could be made, although the search was not reported in this verbal report.

Step 11 indicates that the expert continued her examination of the title page, as she found some special problems. Two problems were identified. One is the phrase "conducted for master report" on the title page. The other is another phrase "contemporary pediatrics" in Step 13. It is unclear from the self-administered verbal report what the cataloger did between Steps 11 and 12 that led her to the decision of Step 12. Nor is it clear what suggested to her the possibility that the phrase "contemporary pediatrics" could indicate a serial, as noted in Step 14 and her answer in Step 15 that the phrase is a serial title related to the book, therefore requiring an added entry.

Up to Step 15, Expert 165 concentrated her attention on the item at hand and the printout of the preliminary descriptive cataloging record. A step not recorded in this verbal report between Steps 15 and 16 is the process of retrieving the preliminary record for this book from the Multiple-Use MARC System (MUMS) catalog for editing. Beginning with Step 16 (i.e., once the record is located and displayed on screen), the cataloger turned her attention to the online screen. Step 17 describes the workflow that follows the screen display. Step 18 results from the LC's internal administrative routine, which requires all catalogers to identify themselves and date each record in Field 955 as an integral part of the process. Most catalogers do so as the initial step when they create or edit a record on screen.

Because Expert 165 worked on an existing record, the main process was proofreading bibliographic data in fields, as indicated in Step 19. The word *leaves* in field 300 caught her eye in Step 22 because it is a term that deviates from the common pagination method, as indicated in the explanation in Step 23. Preliminary pages present a problem in many descriptive cataloging cases, thus warranting special attention in Step 24. Once Expert 165 finished adding the added entry for the serial title, she had completed bibliographic description in all variable fields of the record. She then turned her attention to fixed fields (Step 26) and as most descriptive catalogers do at LC, checked especially fixed-field boxes 20, 21, and 23 for publication date, language, and geographic code.

One would think that Step 27 completed the process of descriptive cataloging. But in this case, Expert 165 went back to the item and identified another problem that was not indicated earlier in the verbal report: How to interpret the title? The question at hand was whether the book has a long title or a main title with a subtitle. Expert 165 did not consult the tools or rules, nor was there any evidence that a colleague consulted. Although *AACR2* rule 1.1B group deals with the transcription of title proper, no such rule is applicable in this circumstance, nor does any textbook exist that addresses the interpretation of bibliographic data on title pages. Catalogers must, as Hagler (1991) suggests, rely on their own bibliographic judgment in similar cases. This is evident in the decision made in Step 30, where the expert must use her judgment in interpreting the title. Although the expert first paid attention to the title in Step 6, the question of judgment and interpretation (i.e., main versus subtitle) was not raised until Step 29.

Was the problem of main versus subtitle discovered upon completing the work of descriptive cataloging? Or was the problem identified during the title examination in Step 6 and simply stayed in the cataloger's mind until all other, less tricky details were taken care of in the record? The answer is not apparent from the self-administered verbal report.

1. Check if it is duplicate
2. edit Field 260 (publication and distribution, etc area) and fixed field information [no 300 for cip rec.]
3. back to 245 (title and statement of responsiblities area), wonder out loud about the subject
4. fill in 100 (main entry, personal names) without checking the name authority file
3. fill in a note in Field 504
6. browse the table of contents and other preliminaries
7. fill in Field 020 (ISBN), check the validity of ISBN
8. check Subject Cataloging Manual for theological heading
9. check name authority file for 100 heading [ok?]
10. browse other works by the author
11. check other works with title "English enlightenment", consult 650 of some of the records
12. read summary, comparing 650 (subject headings) headings with summary,
13. browse table of contents and the list of illustrations
14. read acknowledgement to see if other thinkers are involved
15. decide to drop "Heaven and hell" as a subject heading, and adopt the two from the other heading
16. add fixed information for Field 043 (geographic code)
17. add two more subject headings for England—Intellectual life
18. search the LC online catalog, MUMS by subject heading using the command: find afterlife
19. search for subject authority record for the heading: Future life
20. read all the headings and notes in 4xx and 5xx
21. note the class number "BT899 or so"
22. find s Future doctrines; use f = bo command to limit the search to books
23. browse the list, display a few records and their subject headings, thinking about "Christianity" as a subdivision
24. find s enlightenment. consult subject authority record, sh85-44032
25. nccs. Delete the 2 SHs for England—Intellectual life. Change them to Enlightenment—England
26. correct a subfield code in Field 650 (subject heading)
27. browse the summary again
28. recall the record using "nccs" command and read the screen
29. check the index of classification schedule, BT, for Future state. Future life.
30. look at the page for BT899
31. use General works. 1951–. pcrd to proofread

Figure 2. Coded Script of the Verbal Report by Expert 606

ANALYSIS OF A THINK-ALOUD PROTOCOL

The second verbal report represents a typical case of a protocol interview in which the expert cataloger was asked to catalog an item while thinking aloud along the process. (See figure 2 for summary notes of the think-aloud protocol). Expert 606 is a whole-book cataloger who has been trained to conduct both descriptive and subject cataloging of the same item under LC's whole-book cataloging project, which started in early 1990s. As the protocol interview began, the cataloger spent some time explaining his strength in descriptive cataloging from his many years of experience and that he had only in recent years been involved in subject cataloging. Because of his background and recent changes in the whole-book cataloging policy on the job, he tended to approach cataloging with special attention

on subject analysis, a new focus of learning for him.

As with the analysis of the first verbal report above, some information about the cataloging setting is in order before the analysis of this verbal report begins. In this case, Expert 606 was conducting both description and summarization with the purpose of creating a cataloging-in-publication (CIP) record for a galley proof submitted by a publisher who intended to use the CIP record upon printing of this book. The galley proof included all preliminary pages and the beginning chapter of the book. The interview took place in a cubicle containing cataloging workstation. Expert 606 had the galley proof pages and the copyright registration sheets submitted along with the galley proof by the publisher. Unlike in the previous case, no preliminary record for this item existed prior to the interview.

The first steps Expert 606 took were to determine whether this item fell into the subject scope of the cataloging team—i.e., religion, psychology and philosophy—and whether it was a duplicate. Once those two administrative questions were answered, the cataloger called up an empty workform on the screen and began to input bibliographic data into field 260 (publication, distribution, etc.) and related fixed field boxes. He indicated that there would be no field 300 (physical description) since this would be a CIP record. Once bibliographic data related to publisher and publication were completed on the screen workform, the cataloger turned his attention to field 100 (main entry, personal name) and filled in the author's name according to his knowledge of *AACR2* chapter 24. He did not check the name in the LC Name Authority File first. Data for the bibliographic note in field 504 were provided as the next step. Upon finishing that, Expert 606 browsed the table of contents and the preliminary pages to see what the book was about. In doing so, he encountered the ISBN number and immediately filled in the ISBN data in field 020 and checked its validity.

As Expert 606 browsed the table of contents and added some possible subject headings to 650 fields (subject headlings) for this item, he checked LC's *Subject Cataloging Manual* for theological headings. Not finding anything particular, he searched the personal name in the LCNAF to verify the form of heading in field 100. To do so, he switched to the MUMS cataloging system, searched the author's name, and found some of the author's works with the phrase "English enlightenment" either in the titles or in the subject headings. He proceeded with a title search using the phrase and consulted the headings in the 650 fields of those items found in this search.

Not satisfied with the subject headings he had on his workform, Expert 606 returned to the item in hand. He read the the summary provided by the publisher on the copyright registration sheets and considered some of the headings found in the above title search. At this point, the cataloger browsed the table of contents again and read through the list of illustrations. He also read the acknowledgments to see if names of other thinkers were mentioned. Upon doing so, he decided to drop one heading and added two other headings. A quick switch from subject cataloging to descriptive cataloging and back to subject cataloging occurred when Expert 606 added the fixed information for field 043 (geographic code). Upon returning to subject cataloging work, he added two more subject headings related to "England–Intellectual life." He then searched the MUMS catalog for the subject heading "Afterlife," and also searched LC's Subject Authority File for "Future life" and read all the headings and notes in Fields 4XX and 5XX. As he did that, he noted the class number to be "BT899" and recorded it in field 050 (LC call number) of his workform.

The cataloger further searched other items with the subject heading "Future doctrines," browsed the resulting list, and displayed a few records. As a result of this browsing, the cataloger began to consider adding "Christianity" as a subdivision to the subject heading. Another subject search was conducted to find the subject authority record for the heading "Enlight-

enment." Upon finishing reading the subject authority record, the Expert modified the subject headings he established earlier on the screen workform by deleting the two subject headings for "England—Intellectual life," changing them to "Enlightenment—England." He also corrected a subfield code in one of the 650s he had used earlier and browsed the summary of the copyright registration sheets again.

At this point, Expert 606 read the entire workform one more time and was satisfied with what he saw. He then turned his attention to assigning the classification number. He checked the classification schedule BT under the index for "Future state. Future life," looked at the page for BT899, and finally decided to use "General works, 1951– ." Classification work done, Expert 606 saved the record and called it up again on the screen to proofread it.

MENTAL PROCESSES

The above description of the two verbal reports collected in this project at LC raises the question, What do the verbal reports tell us about the mental processes of experts involved in the cataloging process? Before answering this question, one should begin by noting that the two expert catalogers reported here have very different mental models even though they both conduct descriptive cataloging at the same institution under the same cataloging policy guidelines.

GENERAL STRATEGIES

In terms of general strategies, Expert 165 exemplifies the common understanding of the cataloging process among educators and practitioners in the field. Her cataloging process follows the typical flow of working on a workform (in this case the printout provided by the preliminary cataloger) in a top-down manner beginning with main entry. Initially she spent time interpreting the item's bibliographic data, then moved on to the development of a draft record on the printout before she finally went to the computer to actually

edit the screen workform. The workflow of Expert 165 largely begins with determination of access points, moving on to authority work, providing description, and finally editing the record.

Expert 606, on the other hand, concentrated on the task of subject analysis throughout his protocol (which he believed was not his strength) and completed the routine tasks (such as filling out the descriptive fields) along the way. In many cases, the bibliographic data he recorded in the descriptive fields were used to a great extent in his research work for subject analysis for the item. While no defining workflow appears in his cataloging process, there was a clear, consistent theme to his cataloging process: subject analysis, with every other cataloging task for the item fit in around the theme. In comparison with Expert 165, Expert 606's descriptive cataloging workflow largely begins with providing description (ISBD area 4, publication and distribution, etc., area) before moving on to determining access points. For Expert 606, unlike Expert 165, creating and editing the screen workform is an ongoing process, not a separate step at the end.

PROBLEM SOLVING

To a certain degree, the two expert catalogers are similar in their approaches to problem solving. Both experts ruled out problems of an administrative nature (such as whether a specific book falls into the scope of their team) early in the process, but when it comes to problems of a substantial nature (such as interpretation of bibliographic data or matching the scope of subject headings with the topical themes of the item), the two experts differ. Expert 165 noted the problem of interpreting potential components of the title at the end of the session only after all other tasks were completed, and appeared reluctant to make personal judgements during the process without giving herself time to think or to consult with others. This strategy, although it kept the expert free from distraction in the process, does carry the risk that she might simply forget to make a decision on this item. Taking a

different approach, Expert 606 made the special problem the central theme of his process and tried several alternative methods to reach his own satisfactory conclusions. Even when confronted with the need to verify the name authority form for the personal author, Expert 606 simply filled in Field 100 with what he considered to be the correct form of heading and only later returned to verify the form in the LCNAF.

THE ROLE OF THE SCREEN WORKFORM

One particularly interesting aspect in analyzing the verbal reports of the two experts is the way in which they use the cataloging workform on the computer screen. A screen workform is an empty or incomplete cataloging record with necessary MARC tags into which bibliographic data are added and edited to create a cataloging record for an item. The workform is the basis of the end-product in the cataloging process. Calling up the screen workform for the item at hand after she had verified all routine bibliographic data needed for description, Expert 165 appeared to treat the workform as something much closer to what one might call the end-product. Her verbal report suggests a formality to her process in which enough preparation must be done before proceeding with dealing with the screen workform.

This is absolutely not the case for Expert 606, who called up a new workform the moment he sat down with the item and began filling in bibliographic data without much preparation. In many cases, the data in descriptive fields appeared incomplete or unverified until he went back a second time. Potential subject headings for the item were recorded into 650 fields as they were discovered at various times of the protocol interview, only to be deleted or modified later. The screen workform appeared to serve the same function as a blackboard on which he sketched out the blueprint of the cataloging record and changed his sketches as his thinking evolved. The screen workform did not become the actual end-product of a bibliographic record until he saved it and called it up again for proofreading.

POTENTIAL HYPOTHESES

Based on the forgoing discussion, I offer some hypotheses on the mental processes and the expertise of catalogers.

The first is related to the cataloging record. Some expert catalogers apparently follow the traditional concept that a cataloging record is regarded as the end-product of the cataloging process and therefore tend to formalize the steps of creating and editing cataloging records only after a certain level of preparation is done. Other expert catalogers view a cataloging record as a workspace that can be used to draft their ideas and store their work progress; they consider the data in the record to be subject to constant change without any fear of losing the integrity of the cataloging record. One would think that the latter type of expert might be more open to changing bibliographic records even after they reach users.

Two issues related to this require further investigation. One is whether expert catalogers favor one model over the other. The other concerns the implications this hypothesis has on the common institutional practice among many cataloging systems regarding whether and how an error found in an existing record is corrected and who is authorized to do the correction.

The second hypothesis has to do with the free use of association to build one's own cataloging expertise, as seen in the second verbal report. Since Expert 606 perceived subject analysis as not one of his strengths (even though he possessed a few years of experience in it and might be considered an expert in that area by many people), he took the liberty of using whatever bibliographic data he could find to research the appropriateness of subject headings and to improve the degree of scope-match between the subject headings and the topical themes of the item. Data he used in networking and association in his protocol included (a) the author's name, (b) the author's other works, (c) other scholars' names associ-

ated with the author by virtue of their appearance in the acknowledgment, and (d) works that share similar topical terms, among others. This networking and association strategy has proven to be a very powerful tool for learning and self-improvement in cataloging.

The third hypothesis offered here is based on the observations in both verbal reports suggesting that certain cataloging tools were not utilized in the experts' cataloging process as often as one would think. Expert 165, for example, appeared so confident in her knowledge of rules and tools that the use of rules and tools was never mentioned in her verbal report. Even when she noted the special problem of interpreting parts of the title at the end of her report, she made no attempt to check rules or local policy documentation to see if anything could help her decision. The only tool she used during the process was the Name Authority File. Expert 606, on the other hand, make extensive use of tools, including the Name Authority File, Subject Authority File, MUMS catalog, and the *Subject Cataloging Manual*. This leads to a possible hypothesis that cataloging tools are really of two kinds—the formal tools, such as *AACR2* and Library of Congress *Classification* systems, and the contextual tools, which are specific to the cataloging end-products within a particular institution—and that the formal tools are used primarily for training, and the contextual primarily for local practice.

CONCLUSION

This paper demonstrates that the use of verbal reports is a valuable technique in in-depth studies on the quality of cataloging expertise. As many researchers and practitioners alike struggle to teach cataloging, to explain its professionalism, to train new catalogers, and to improve their own acquisition of cataloging knowledge and skills, the analysis of verbal reports, such as done here, can provide critical insights into the general strategies, mental models, and problem-solving skills of cataloging. Further analysis of the data gathered should offer specific proofs to test the three hypotheses described above

and better understanding of the mental processes and expertise in cataloging.

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Use Studies: A Selective Review

Nancy J. Butkovich

Librarians have conducted hundreds of studies exploring various aspects of collection use in libraries. Most studies are of journal collections in academic libraries; however, the principles of conducting use studies are generally applicable to other materials and other types of libraries. Use studies can be conducted in a wide variety of ways, and they can measure different aspects of the use of a collection. Each method has its own particular strengths and weaknesses. If a combination of methods is used, the weaknesses of each method can be offset by the strengths of the others, and a truer picture of overall use can then be obtained.

Librarians have conducted hundreds of studies exploring various aspects of collection use in libraries (Millson-Martula 1988). Most of the works reviewed in this article are about studies of journal collections in academic libraries; however, the principles of conducting use studies are generally applicable to other materials or types of libraries. In its broadest sense, use is defined as "whether and/or how often a book, periodical, or segment of the collection is used" (Christiansen, Davis, and Reed-Scott 1983, 434). In practice, however, there is no agreement on what a "use," (Broadus 1985a; Metz and Litchfield 1988; Rice 1979) let alone "low use," really is; the definitions vary according to local needs (Millson-Martula 1988).

A use study is any method of data retrieval that answers, or helps to answer, basic questions regarding the acquisition, storage, and retention of materials in the collection. There are many different types of use studies, and each has certain strengths and weaknesses. Nonetheless, librarians continue to conduct them in an effort to manage various aspects of their collections.

In this paper, I will take the broad view of what constitutes a use study. I will review a variety of different methods that have been discussed in the literature. These include core lists and opinion surveys, reshelving studies, patron observation, circulation studies, interlibrary loan and other form-based requests, citation analyses, and impact factors. The measurement of non-use of collections will also be examined. This paper will conclude with a mock use study that applies many of the different methods discussed in this paper.

Use studies are conducted for a variety of reasons. One of the most common given is to aid in deciding which serial subscriptions could be cut (for example, Alldredge 1983; Chrzastowski 1991; Evans 1990; Milne and Tiffany 1991b; Naylor 1990; Veenstra and Wright 1988). Other reasons include adding new titles (Evans 1990), determining a need for duplicate subscriptions (Naylor 1990; Veenstra and Wright 1988), transferring material to storage locations (Christiansen, Davis, and Reed-Scott 1983; Fjallbrant

1984; Harris 1977; Rice 1979; Taylor 1976–1977; Veenstra and Wright 1988) or withdrawal of materials (Fjallbrant 1984; Harris 1977; Rice 1979), and justification of previous serial cancellations (Bustion and Treadwell 1990). Data may also be used to determine which titles are essential, and the distribution of collection development funds may be based on use data. In addition, use studies can identify who is using the collection as well as what is being used (Christiansen, Davis, and Reed-Scott 1983).

Just as there are different reasons for conducting a use study, there are also a variety of problems associated with them. Some of the more commonly mentioned ones include staffing requirements (Millson-Martula 1988), the expense of running the survey, and questions concerning methodology and validity (Broadus 1985a; Millson-Martula 1988). There is often concern that quantitative measures alone do not accurately reflect use. "Subjective factors, such as value or relevance to the curriculum . . . " (Millson-Martula 1988, 128) are also important.

Patrons might not cooperate with use studies, and might actively try to bias the survey results (Milne and Tiffany 1991a; Naylor 1994). They can also unintentionally distort results. For example, in reshelving studies using the sweep method, the materials that users reshelve themselves are not included in the final count, resulting in an underreporting of actual use (Broadus 1985b; Naylor 1993; Naylor 1994).

Information use patterns vary among disciplines (Metz and Litchfield 1988; Naylor 1990), and information formats differ in the way they are used (Metz and Litchfield 1988). The number of people working locally within a discipline should also be considered (Naylor 1990). Single-faceted use studies cannot measure total use. Instead, as was noted about reshelving studies, they measure some subset of total use (Rice 1979). Consequently, multiple approaches to use studies are better because they allow the librarian to get a more complete picture of the whole than would be possible if only one method were employed.

Authors often disagree, however, about the relative value of a particular method. For example, Broadus states that "If proper allowances are made, counts based on the JCR [Journal Citation Reports] can be almost as good as expensive local studies for predicting use of periodicals in a given library" (1985a, 33). On the other hand, Line declares that "no measure of journal use other than one derived from a local use study is of any significant practical value to librarians" (1978, 315).

Use studies vary considerably in their duration. Some circulation studies last just a few days. In an effort to determine the shortest reasonable time length for a circulation study, Metz and Litchfield conducted a study that utilized sets of data gathered at two different times several years apart. In the first interval, they examined all the materials circulating on a particular day. They also examined circulation over a period of several months. After comparing the results, they concluded that three days was probably the shortest duration for a reasonably representative circulation study, provided that the sample size was sufficiently large (Metz and Litchfield 1988). A similar conclusion was reached by Bulick, Sabor, and Flynn (1979).

Some of the most common studies are reshelving studies of various types. A fairly common, though by no means universal, time length is one year (Alldredge 1983; Gossen and Irving 1995; Milne and Tiffany 1991a, 1991b; Naylor 1990; Schmidt, Davis, and Jahr 1994). However, a circulation study of monographs at the University of Pittsburgh lasted more than seven years (Bulick, Sabor, and Flynn 1979; Kent 1979). Longer time lengths have a major advantage over shorter ones, at least in academic institutions, because they even out variations in use caused by the academic calendar (Milne and Tiffany 1991b; Naylor 1990; Schmidt, Davis, and Jahr 1994).

Line and Sandison warn that "ranked lists of crude 'uses' are valueless" (1975, 393). They state that librarians should consider "how many uses per monetary unit each journal provides . . . . [and] . . .

the number of uses per unit of shelf space . . ." (Line and Sandison 1975, 393; italics in original). Several authors have incorporated, or at least considered, one or both of these concepts in their work (for example, Gossen and Irving 1995; Rice 1979; Rooke 1990).

Veenstra and Wright noted "a significant inverse relationship between the size of a library periodical collection and the percentage of the journal collection that may be expected to receive use" (1988, 171). The same observation was also made by Flynn (1979). Intuitively, however, this seems logical, because smaller collections would probably have a heavily-used core collection and very few marginal titles. A larger collection, simply because it is larger, would probably have the same heavily used core, but also have a higher percentage of the titles that are outside the core.

CORE LISTS AND OPINION SURVEYS

Although core lists do not measure use, they do give an indication of the importance of a given title to some individual or organization. Titles appearing on these lists can vary considerably from institution to institution. Line noted that "A glance at the list of the most requested journals [from the British Library Lending Division] shows that they are all high-status, high-use, commonly held journals" (1978, 313).

There are different types of core lists. For example, accrediting agencies might have a list of required or recommended titles that they expect to see in libraries supporting departments or institutions wishing to receive or to maintain accreditation (Millson-Martula 1988). The American Chemical Society (ACS) is a good example of this. The ACS has a list of recommended and required serials that it deems necessary to support an undergraduate chemistry curriculum (American Chemical Society 1993).

Within an academic institution there are also core lists that have been prepared internally and consist of lists of titles considered to be essential for teaching or research. These are generally produced

by polling faculty (Bustion and Treadwell 1990; Schmidt, Davis, and Jahr 1994). In one study the core lists were prepared using opinion surveys prepared by the faculty, who were asked to list the titles they felt were most important. When the results were compared with data obtained from other studies based on citation and circulation data, the investigators found that virtually the entire core list appeared in one or the other of the two studies (Schmidt, Davis, and Jahr 1994). Sometimes core list polls are included in questionnaires that cover "all aspects of periodical use of the library" (Ambia 1991).

In other cases faculty were presented with a list of titles and asked to assign a value measure to them (Bustion and Treadwell 1990; Fjallbrant 1984; Naylor 1990). These studies generally confirmed that low-ranked titles on faculty surveys were seldom used in reshelving studies (Bustion and Treadwell 1990; Fjallbrant 1984). The authors of one study also found that there was very little correlation between the faculty-generated lists of essential titles and the reshelving data (Bustion and Treadwell 1990).

Some opinion studies are based on the professional judgment of librarians rather than the academic faculty. In one study librarians considered "language of publication, to see whether it was a language taught on campus; whether the journal was indexed and if the indexes were held in the library; and the appropriateness of the title to the curriculum" (Swigger and Wilkes 1991, 43). In another study in which some academic departments chose not to rank titles, librarians developed cancellation lists based on "their best judgment" (Bustion and Treadwell, 1990, 43). In a study described by Broadus, White concluded "that the subjective judgments made by librarians have in general been correct in regard to what subscriptions should be discontinued" (Broadus 1985b, 58).

Opinion studies produce results that might be of questionable value because the motives of the people producing the lists are unknown. Also, various groups prepare lists in different ways. Therefore, the level of participation by individuals

within a group is uneven (Swigger and Wilkes 1991). Care should be taken that the number of people surveyed is large enough to produce valid results. The same statement also applies to the number of people who respond to a survey (Veenstra and Wright 1988). Patrons might also incorrectly remember which journals they use (Broadus 1985b). Use by researchers and students in other areas should be considered, because users outside a given discipline could have different needs than users within (Greene 1993). Nonetheless, opinion studies, particularly those based on faculty responses, are often an important, and in some cases, the only basis used by librarians to make collection development decisions (Millson-Martula 1988).

RESHELVING STUDIES

Reshelving studies are popular for gathering use data, and the use of both bound and unbound journals have been analyzed using them (Chrzastowski 1991; Milne and Tiffany 1991b; Naylor 1990, 1993, 1994).

There are two broad types: sweep studies and check-off studies. The sweep method measures what patrons take off the shelf and leave for library staff to count and reshelve (Ambia 1991; Evans 1990; Konopasek and O'Brien 1984; Naylor 1990, 1993, 1994). The check-off method requires patrons to tick off each use of a volume or issue on some sort of tally sheet or sticker attached to the covers of the items being surveyed (Konopasek and O'Brien 1984; Milne and Tiffany 1991a; Naylor 1993, 1994).

In some cases items were found that had been misshelved or otherwise disturbed. These were often included in reshelving results (Alldredge 1983; Evans 1990; Konopasek and O'Brien 1984; Naylor 1993), as were titles that had been used for interlibrary loan (Evans 1990; Fjallbrant 1984).

Both methods have their weaknesses. The sweep method requires an investment of staff time to record the data. It does not record use where patrons reshelve the materials themselves (Naylor 1993, 1994). Depending on the local cir-

cumstances this can be a significant portion of the total use. Two reshelving studies using the sweep method yielded results representing only 20%–25% and 40% respectively of the total use (Taylor 1976–1977), while a third reported an average of 19 uses in which material was reshelved by patrons for every item left for library staff to reshelve. This undercounting varied by discipline (Harris 1977). Still another noted that "In all cases of use for less than ten minutes, the journal was reshelved [by the patron]" (Wenger and Childress 1977, 294). Finally, this method does not take into account how patrons used the materials. "Whether that happened because someone looked at the table of contents, read one article, or read the whole issue remains unknown" (Swigger and Wilkes 1991, 42).

In theory the check-off method eliminates, at least in part, these weaknesses, in that it puts the onus of data recording on the patron instead of the library staff. In practice, however, users often did not record the use (Naylor 1993, 1994). Also, patrons sometimes appeared to inflate use by making multiple ticks for a single use (Naylor 1994).

In studies of the same collection using the two methods, the sweep method produced use levels at least 40% higher than those obtained by the check-off method (Naylor 1993; Naylor 1994). In another study, researchers checked reshelving data obtained using the check-off method and determined that the check-off method underreported actual use by one third (Milne and Tiffany 1991a, 1991b).

NON-USE STUDIES

Although reshelving studies usually register use, they can also be used to measure non-use of a collection.

Non-use studies are relatively simple to conduct (Alldredge 1983; Rooke 1990), but they are susceptible to error. They do not attempt to determine why a title is seldom used. This method is either a yes-it's-used or no-it's-not-used method; it cannot accurately register multiple uses or identify how volumes are used (Rooke

1990). It can, however, indicate whether in-house materials were used and reshelved by patrons (Harris 1977).

One such study utilized a variation of the check-off method, with a sticker on the cover of a current issue being checked-off when it was reshelved (Alldredge 1983). Other studies addressed non-use of bound journals. This was often determined by markers inserted into volumes in such a way that anyone using a given volume would be forced to disturb the marker (Harris 1977; Rooke 1990; Taylor 1976–1977). Sauer studied both "nonuse of current [journal] issues and nonuse of bound volumes and microfilms" (1990, 100). Over half of the titles with unused current issues also had unused back runs.

To establish a control, higher use titles are sometimes used (Rooke 1990; Taylor 1976–1977). In both studies, researchers converted the raw data into an index number using equations that compensated for different variables (Rooke 1990) or the amount of shelf space needed to house the title being surveyed (Taylor 1976–1977). Rooke figured use data and the size of a title's backfile into calculations that eventually generated a cost-per-use figure. Although studies that approximate the density of use can be valuable, they can be misleading because some titles can be high use titles yet still have low densities of use. Attempting to store or cancel these titles can have serious implications for the patrons (Wenger and Childress 1977).

CIRCULATION

Circulation studies are useful because they can measure use, such as undergraduate use, that might not be reflected in other study techniques. They also can measure what is actually being removed from the library and which patron groups borrow the materials. Because the data are easy to obtain and because factors influencing the data, such as time length and amount of material used, can be controlled, the data can be manipulated and analyzed in a variety of different ways (Christiansen, Davis, and Reed-Scott 1983).

Circulation studies fall into several broad categories. In one study, the author looked at what was actually checked out during a given time span (Chrzastowski 1991). In some cases circulation figures also included reshelving data (Schmidt, Davis, and Jahr 1994). Other authors examined the characteristics of everything that was in circulation at a given time (Metz and Litchfield 1988). Still another considered circulation history based on the dates that items circulated. Taylor considered any title that met the criteria set in his 15/5 Circulation Rule as a candidate for remote storage. He defined this rule as "all volumes of that title which were published in the last fifteen years [and that] have not been borrowed during the last five years" (1976–1977, 38).

In comparing circulation statistics with reshelving data, Metz and Litchfield (1988) found that circulation data reflected in-house use fairly accurately. Others took this analysis a step further and noted that circulation data also mirrored interlibrary loan lending (Bulick, Sabor, and Flynn 1979). Neither variations in time nor different methods of analysis appeared to cause any major fluctuation in the data (Metz and Litchfield 1988), and a correlation, which varied by subject, seemed to exist between external circulation and internal reshelving data (Harris 1977).

Researchers at the University of Pittsburgh were able to establish circulation histories for monographs added to the collection in the first year of the study (Bulick, Sabor, and Flynn 1979). Reshelving data was also used to check the circulation data. They found enough correlation to "conclude that in terms of whether or not a book or monograph is ever used, it is sufficient to examine the external patron circulation data" (29).

Schad (1979), however, raised several objections to the Pittsburgh study. In critiques relevant to circulation studies, Schad argued that not all circulation transactions are recorded in an electronic system, and that books may be used without being checked out. Christiansen, Davis, and Reed-Scott (1983), made these same observations in comments regarding circulation studies in general.

Generalizing Schad's objections, circulation studies measure past use; future use might be quite different as research areas change, and circulation based on instructional use will be radically different from circulation based on research use (Schad 1979; Voigt 1979). In cases where date due stamps are counted, undercounting can occur when items are checked out or reshelved but are not stamped (Harris 1977).

PATRON OBSERVATIONS

Not everyone takes library materials to a table or out of the library to use them. Many people, for various reasons, choose to use the items in the stacks, and they often reshelve the materials themselves. In either case the materials that they use, whether monographs or serials, do not get included in use studies based on reshelving statistics.

One method for obtaining information about materials reshelved by patrons is the unobtrusive study. In this method, patrons are observed and the number of items they use are counted, while the patron remains unaware of the observer (Bustion, Eltinge, and Harer 1992; Ross 1983).

Like all other methods of measuring use, however, this too has its weaknesses. The observers need training in what they are to look for and how to interpret what they see. Another potential problem is that the observer often will be unable to identify specific titles being used, a problem that does not affect other methods of determining use. Finally, cost is also a factor. The unobtrusive observation method is significantly more expensive to use than a reshelving study (Bustion, Eltinge, and Harer 1992). The results can be worth the effort, however. Ross noted that each patron observed during that study removed an average of 6.74 books and reshelved an average of 5.52 books (1983).

Flynn (1979) used an obtrusive method that involved searching the journal stacks for patrons using journals. The observer would then either interview patrons about their use or would request that the patrons complete a form concern-ing their use of the journals. Some problems were noted with this approach. In some cases users refused to answer some survey questions. In other cases the information patrons provided did not fit in the categories on the forms. Also, some patrons left before the observer could conduct the survey.

CITATION ANALYSIS AND IMPACT FACTORS

Citation analysis is a method that analyzes the characteristics of references cited in published literature. Although Broadus (1985a) states that citation analysis is quite useful and sufficiently accurate to replace local studies, several others remain unconvinced (Chrzastowski 1991; Naylor 1990; Rice 1979; Scales 1976; Swigger and Wilkes 1991). Swigger and Wilkes (1991) qualify their position by arguing that citation studies could be very useful if they were used in conjunction with other methods. They also observe that smaller libraries, because they are less likely to support large and varied research programs, would probably find the generic citation rankings to be more useful than large institutions.

Certainly citation studies based on an entire citation index have well-documented problems. Some of the most obvious are: only the first author of a cited work is listed; there is no authority control for author or journal names; some titles are so truncated as to be unusable; and citations by many patron groups are not included because their written output is not indexed (Schmidt, Davis, and Jahr 1994). Also, many citations are omitted because the literature of some disciplines is not well represented (Broadus 1985a; Swigger and Wilkes 1991) and because only journals are used to produce the *Journal Citations Report*. Other formats, which also contain citations to bodies of work, are omitted (Scales 1976). There is also a possibility that "the citation rankings in *JCR* are of more use for American than for British libraries, but ... no firm conclusion of this sort can be drawn" (Scales 1976, 21). Citation patterns can vary within subject areas as well as across

subject boundaries. Time lag in various stages of the publication cycle can also influence citation data (Christiansen, Davis, and Reed-Scott 1983).

On a more fundamental note, there are problems inherent in the citations themselves. For instance, authors commonly use some types of materials that rarely get cited (Schmidt, Davis, and Jahr 1994), and "It is possible that some authors cite articles they have never read . . . . [Also,] faculty research interests may change, so past citations of a journal may not predict future use" (Swigger and Wilkes 1991, 44).

Different user populations may use the same body of literature in different ways. For example, McCain and Bobick compared citations in faculty articles, student dissertations, and "qualifying briefs written by second-year students entering the Ph.D. program" (1981, 258). They found that, even though all three populations were related to each other, there were significant differences in the way each population used the same collection (McCain and Bobick 1981).

An additional problem is that the author may not have used a library copy, even though the title is present on the library shelves (Swigger and Wilkes 1991). Also, libraries may not own everything cited by their users (Schmidt, Davis, and Jahr 1994). Intuitively, one suspects that this would not be true with citation studies of undergraduate papers, particularly because undergraduates often do not have access to interlibrary loan facilities. In just such a study, Magrill and St. Clair (1995) made this assumption, because they saw no evidence to the contrary.

Nonetheless, citation studies can be quite useful if these limitations are kept in mind. In an academic setting, they can identify heavily used titles, provided that "undergraduate use is not ordinarily heavy, or if most users come from the primary constituency of the library" (Schmidt, Davis, and Jahr 1994, 63; underlining in original). Even when using online citation indexes, one can target that "primary constituency" by limiting the study to users within a specific location or zip code. Studies of online citation indexes have been an integral part of journal

collection development in the Physical Sciences Library at Penn State for several years. SCISEARCH has also been successfully used for local citation data by working with the corporate source field and then analyzing the citations appearing in the articles retrieved (Green 1993).

Collection use by undergraduates is not reflected in citation studies based on the journal literature, yet undergraduates constitute the largest patron population in academic libraries. In an effort to understand use patterns of this critically important patron category, Magrill and St. Clair (1995) did a citation analysis of undergraduate papers from four academic institutions—two universities having an emphasis in scientific and technical research, and two church-supported liberal arts colleges. They found that science students listed approximately two times the number of references in their papers as humanities or social sciences students. Also, nearly two-thirds of the references listed by science undergraduates were to journal articles, while humanities undergraduates used approximately the same percentage of books. Social sciences students used journals at a slightly higher rate than humanities students.

Another value generated by the citation data is the impact factor of a journal. The impact factor "measures the number of times the articles in a journal have been cited in a given time period, divided by the number of articles in that journal" (Schmidt, Davis, and Jahr 1994, 47). Because it is based on a large body of literature cited by authors from many different countries, the impact factor assigned to a particular publication reflects international rather than local impact. One comparison of impact factors with local use data found that the correlation between them was weak (Schmidt, Davis, and Jahr 1994).

INTERLIBRARY LOAN AND OTHER FORM-BASED METHODS

Several authors, such as Evans (1990), have examined interlibrary loan statistics. These data can provide valuable information regarding the use of material that is

not owned locally (Ambia 1991; Chrzastowski 1991) as well as identify which local holdings are lent to others outside the institution (Chrzastowski 1991; Fjallbrant 1984). Gossen and Irving (1995) compared data from a use study of bound and unbound journals with data from an ARL/RLG interlibrary loan cost-effectiveness survey.

Interlibrary loan guidelines stipulate that an institution may receive only five copies of articles from the five most recent years of a journal within any one year period. Any requests above this amount are considered outside the fair use provisions and are subject to copyright royalty payments (Gossen and Irving 1995; Naylor 1990).

Because of copyright law requirements, interlibrary loan departments keep records of items requested from other institutions, particularly regarding journal articles. Therefore, these records are an excellent source of information regarding what is being borrowed from other institutions. It is best, however, not to rely on only one year's data, because the five copy limit is low enough that one patron could easily skew the results. However, if titles appear on the list year after year, then the title should become a candidate for addition to the collection.

The same logic holds true for external document delivery data, although many services allow patrons to order directly from them. Because, in these cases, the library is not being used as an intermediary, the library will have only a partial picture of the information being requested through this medium. Christiansen, Davis, and Reed-Scott discussed advantages and disadvantages of an internal document delivery study, which "simulates users walking into the library and each user looking for a particular item" (1983, 436).

Other form-based data sets are potential sources of use information. Photocopier use logs are one such method (Johnson and Trueswell 1978; Veenstra and Wright 1988). Others are requests for photocopies made by library staff (Ambia 1991) and requests for material housed at remote locations. The latter data source is currently being studied at Penn State.

A LIBRARY SCENARIO

The method or methods employed in any given library at any given time should depend on the needs of the library and the resources available for the study. As has been stated earlier, each different measure has its strengths and weaknesses, and they can gauge different aspects of collection use. Furthermore, although they can measure past or current use, they cannot measure future use, so use data should be collected on a regular basis.

Ideally, different methods should be used in tandem. Consider the scenario of a librarian in an academic setting who is responsible for a collection with extensive journal holdings. Because of the history of serials pricing during the past decade, this librarian might anticipate the possibility of having to conduct serials cancellation projects on an annual basis. What might the librarian do?

In this example, the librarian might choose to search the SCISEARCH database for local citation data. If journal holdings circulate and the local online catalog has the proper report generating capabilities, circulation data could be obtained. The librarian might also choose to poll the faculty using the collection as well as the library staff, particularly the staff who are close to the reshelving operations. Interlibrary loan data, both borrowing and lending, and other document delivery data could also be obtained. All of this information is usually available at a relatively modest cost, and can be collected in a reasonably short time frame.

Although the results are weighted in favor of faculty and graduate research interests instead of undergraduate and casual use, the inclusion of input from the library reshelving staff should moderate this bias somewhat. However, the librarian might also choose to superimpose on this annual process other use measures, which could be conducted on a less frequent basis.

For instance, a reshelving study using the sweep method might be conducted. Because this method does not consider who was using the collection but only what was being used, some of the imbalance

between user populations could be eliminated. However, it still does not address the users who reshelve their own material. For this the librarian may decide to conduct a study of non-use of selected titles to verify the reshelving data. This might also be useful in the case of titles that are producing contradictory results in the different use studies. The librarian might also opt to study the people browsing the journal stacks. Although not as useful for particular titles, this method can provide a measure of the level of undercounting in other methods.

CONCLUSIONS

Use studies can be conducted in a wide variety of ways, and they can measure different aspects of the use of a collection. Each method has its own particular strengths and weaknesses. Unfortunately, results obtained from use studies are sometimes ignored, or if considered, weighted so lightly as to be unimportant (Millson-Martula 1988). However, many years of static or declining budgets combined with increasing prices for both serials and monographs require librarians to use every means possible to justify budgets. At the same time, costs of storing collections are also rising. Libraries can no longer afford to own everything, and low use materials, however they are defined, need to be identified.

This means that use studies become very important sources of justification data. If a combination of methods are used, their weaknesses can offset each other, and a truer picture of overall use might be obtained. A particular set of data can become obsolete, however, because the interests of the users are dynamic rather than static. Therefore, it is important to integrate use studies into the normal work flow of a library. By doing this, the data will be available when needed, and the librarian can confidently make appropriate collection decisions.

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The Citation Maze: A Beginner's Guide

Barbara Frame

The variety of ways in which citations can be used in libraries is broad, sometimes confusing, and often poorly understood. Citation studies can, however, be classified into four general types: (1) Bibliometric studies conducted to determine which journals in a given field are the most important to scholars in that field, (2) Citation counting in order to assess an author's eminence, scholarly or otherwise, (3) Studies designed to describe or map the literature of a particular subject, and (4) The use of citations as a direct means of collection evaluation.

W̶hen librarians talk among themselves about citation analysis, the conversation is likely to drift into confusion and incomprehension. This is, at least in part, because citation analysis assumes a wide, often bewildering, variety of forms, and is used for a broad range of purposes.

Citation analysis is distinguished by its extreme variability and flexibility: "There is no standard procedure for using citation analysis, and no standard protocol for interpreting the results" (Smith 1988, 220). Rather, since each study is carried out for a specific and often unique purpose, the basic methodology is subject to constant re-adaptation, depending on the project at hand.

FOUR TYPES OF CITATION STUDY

Nevertheless, it is possible to divide citation studies into four general types. They are:

1. *Bibliometric studies conducted to determine which journals in a given field are*

the most important to scholars in that field (Faigel 1985; Hall 1985).

This form of citation analysis may be useful in establishing which journals are the most reputable in their fields, and may therefore assist in collection development. Citation-counting exercises are carried out in order to produce ranked lists which can be useful in extending, reducing, or otherwise rationalizing a library's periodical subscription (Broadus 1985; Fitzgibbons 1980; Pan 1978; Swigger and Wilkes 1991; Voos 1981; Wiberley 1982).

The underlying principle is known as Bradford's law of scattering, which "postulates that a small core of journals will publish the great majority of articles in a discipline and the remainder will be scattered in a large number of journals" (Hall 1985, 55). Traditionally, "Monographs have received less attention than serials because of the low frequencies of citations in the sciences where most of the the studies were conducted" (Fitzgibbons 1980, 294).

Bibliometric studies have not met with

BARBARA FRAME is Librarian, Hewitson Library, Knox College, Dunedin, New Zealand (hewitson@rivendell.otago.ac.nz). Manuscript received March 25, 1996; accepted for publication July 6, 1996.

universal approval. Dissenters include Line (1978, 313), who argues that "no measure of journal use other than one derived from a local-use study is of significant practical value to libraries," and Scales (1976) who believes that, because of discrepancies between citation rankings and frequency of actual use, the method cannot be considered reliable. Smith (1988) argues that the method is intrinsically flawed, and too subject to error to be useful.

2. *Citation counting in order to assess an author's eminence, scholarly or otherwise.*

As institutions of higher learning strive to improve academic accountability, to balance budgets, and to allocate funds in often fiercely competitive environments, analyzing citations of publications by staff members is increasingly seen as a way to measure the value of staff research and hence of assessing the relative merit of individuals within the institution. Ban Seng and Willett (1995) report on a citation analysis project comparing citations per academic staff member with ratings received in an official research assessment exercise. They also found that citation-conscious researchers are likely to attract more citations in certain kinds of publications.

Assessments of the validity of this activity vary considerably. Garfield (1970) has suggested that citations can reliably be used in allocating "prizes, grants, fellowships and other forms of recognition," and even in predicting Nobel prize winners. Elsewhere, however, (1963) he acknowledges that overestimating their significance can lead to the undeserved prominence of individuals such as the discredited Russian biologist Lysenko. Comfort (1970) points out that reliance on citation counts could elevate the late Chairman Mao to the position of top scientist, while consigning Jesus Christ to obscurity.

Similarly, others discount the value of citation counting as a measure of the merit of institutions or groups of researchers (Carey, Solomon, and Wilson 1995). The method is suspect because original articles may be eclipsed by new articles, because even articles by eminent scholars may contain errors, because unimportant articles in currently fashionable research areas may be heavily cited, and because groundbreaking articles may not receive attention for several years. Kelland and Young (1994) point out that not all citations are of equal value, because of their wide variety of functions: citation may be done for purposes of criticism or refutation, and perfunctory or misleading citation, or excessive self-citation, may distort findings.

3. *Citation studies whose purpose is to describe the literature of a particular subject, usually to provide insights into the nature of scholarly communication.*

In such studies, variables such as format, age, language, and subject spread may be analyzed. Examples include: Attwood's (1991) study of citations in New Zealand Libraries, conducted in order to examine influences on New Zealand library researchers who publish; Heinzkill's (1980) examination of the characteristics of references in journals devoted to English literature; and Popovich's (1978) description of a business management collection.

Nisonger (1983) enhanced the usefulness of this kind of study by further analyzing his samples in terms of language, format, date, and subject area. Although this technique has implications for collection development, it is less likely to be useful in evaluating or comparing library collections.

4. *The use of citations as a direct means of collection evaluation.*

Citations are gathered, and checked against library holdings to determine the extent to which "the work could have been written with the resources available at that library" (Hall 1985, 56). Studies of this kind, sometimes referred to as citation-reference studies (Mosher 1984) fall into two main sub-groups:

1. Citations are gathered from works produced outside the institution conducting the study. Bland (1980) suggests compiling lists from the cita-

tions of standard college textbooks. The method was tested by Stelk and Lancaster (1990, 193), who found that "sources cited in texts required in undergraduate courses can indeed be a useful component in the valuation of the holdings of an undergraduate library." Gallagher (1981, 37) used the citations in a classic ophthalmology textbook to determine the extent to which it "could have been written using the library's collection as the primary literature source," and expressed satisfaction with the validity of the results. Nisonger (1983) tested two specific techniques—which differed in the ways the citations were selected from source journals—in evaluating a political science collection, and concluded (p. 174) that both techniques employed "reliable and valid evaluation methods." Since postgraduate materials were involved, he doubted the effectiveness of this particular approach "for evaluating a collection's ability to support teaching at the undergraduate level."

In a further development of this method, Lopez (1983), using titles from *Choice* as a starting point, developed a five-level process in which cited items were themselves used as sources of citations, and a complex scoring system was employed. This refinement fosters the inclusion of older and newer library materials, and to some extent replicates the experience of actual researchers.

This method amounts to a sophisticated version of the time-honored list-checking method of library evaluation. In this case the citation gathering becomes an alternative method for constructing the list (Bonn 1974; Gleason and Deffenbaugh 1994; Hall 1985). Unlike evaluation from standard lists, however, it is "based on the principle that the actual use of the material is indicative of its relevance to current research." (Nisonger 1983, 164). Another likely important difference between this refined method and a method using standard lists is

that materials from subject fields other than the one under direct investigation have a greater chance of being represented. Where cross-disciplinary holdings are considered relevant, this may prove an effective means of list compilation (Nisonger 1983). Gleason and Deffenbaugh (1994) found that only 52.2% of the titles they investigated were classified at the relevant Library of Congress classifications.

2. In a further refinement of this method, the citations are taken from published or unpublished works produced within the institution, thereby providing a more accurate reflection of the library's ability to meet local need.

As Line (1978, 313) points out, "What is core to one library is marginal to another." Buzzard and New (1983) took their citations from local dissertations. As source material, Lewis (1988) used books, chapters in books, papers in conference proceedings, and journal articles written by academic staff at his university, as well as Ph.D. theses produced there. Dykeman (1994) investigated the ability of the Georgia Institute of Technology to meet the information needs of its scientists by extracting faculty citations from the INSPEC database.

A particular advantage of this method is that it is both collection centered and client centered, since local needs are accounted for as fully as possible. Also, locally published items are represented; this is important in smaller countries such as New Zealand where libraries must offer the best international materials but also must not neglect the publications of their own country. The method also enables monograph and periodical titles to be surveyed in the proportions in which they are actually used.

The method's main disadvantage is that its results may be skewed by the understandable human preference for the locally available item over the possibly more desirable but less ac-

cessible one: Buzzard and New (1983, 470) noted the possibility "that there may have been a tendency to cite works that were accessible and to omit those that were not." It seems likely that this factor influenced, to some extent, Okomo's (1991) finding that 73% of journal citations from published work generated by science researchers at the University of Benin were available at the University of Benin Library.

CONCLUSION

Citation analysis is a valuable and adaptable tool which can be used, either alone or in conjunction with other tools, to produce answers to a wide variety of library questions. Citations can provide a measuring-stick for elements otherwise very difficult to measure or describe. Citation analysis does not consist of a single method or formula, and whenever it is applied care must be exercised both in understanding the nature of the problem at hand, and in devising methods specifically tailored to its solution.

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Editorial

Richard P. Smiraglia

Library Resources & Technical Services is one of the leading journals in library and information science. It has been my privilege to serve as editor and chair of the editorial board for the past six years—since volume 34, number 3. During that time I have refrained from writing editorials, partly because I wanted the journal to speak for itself through its content, and partly because there was plenty of other work to do. But this is my last issue as editor, and there are a few things I'd like to say before leaving.

The Association for Library Collections & Technical Services (ALCTS), the publisher of *LRTS*, is a very hierarchical organization. Consisting of five sections that reflect the areas of interest of ALCTS members—Acquisitions, Cataloging & Classification, Collection Management & Development, Preservation and Reprography, and Serials—the organization tends to operate according to and within this hierarchy. Thus it is sometimes difficult to view the content of *LRTS* as a unified or integrated whole—as the content of research in collections, for instance—and there is a tendency to view its parts as somehow in competition with one another.

During my editorship (according to my records, which are not completely reliable), 293 manuscripts were received in my office, of which 191 saw print in *LRTS*. One hundred two manuscripts were not accepted for publication, yielding an overall rejection rate of 35%. Articles dealing with cataloging & classification accounted for roughly 58% of the papers published; the rest of the articles were scattered more or less evenly across the other segments of the organization's interests. The relative proportions of subject matter among the papers published follow the same distribution as that of the papers submitted. That is, areas in which a great many papers are submitted see more achieve print and vice versa, areas in which few papers are submitted see fewer reach print. Submissions vary from 5% (acquisitions) to 63% (cataloging & classification). Rejection rates vary widely across these subdisciplines, ranging from 13% for acquisitions (the lowest) to 40% for cataloging & classification (the highest).

In the January 1994 issue (volume 38, number 1), Gregory Leazer and I published a bibliometric analysis of the entire content of *LRTS*' first 35 volumes. In that article we reported the percentages of articles published per section of ALCTS for volumes 1–35. Those percentages have not changed—the relative proportions of articles across the sections have remained stable since *LRTS* was founded in 1957.

Early in my term of office, the ALCTS Board adopted an official editorial policy for *LRTS*, emphasizing the scholarly objectives of the journal (Editorial Policy 1996, 104):

> The purpose of *LRTS* is to support the theoretical, intellectual, practical, and scholarly aspects of the profession . . . by publishing articles (subject to double-blind peer review) and book reviews . . . .

Every manuscript received is reviewed by at least two referees, who offer advice on many aspects of the presentation. Their job is very important, for it is they who uphold the gatekeeping function, deciding for the profession which research results may legitimately be promulgated in the pages of the journal. In the end, very few papers are actually rejected out-

right; rather, the majority are rewritten according to the advice of the referees. This gatekeeping function is very important, because the published research that has been given *LRTS'* stamp of approval in turn forms the basis for future research and therefore determines the advancement of the discipline. As our discipline moves into the murky business of electronic dissemination, we must tread carefully lest we too easily renege on our gatekeeping responsibilities.

Leazer and I hoped with our 1994 article to demonstrate that *LRTS* had the characteristics of a scholarly journal, serving a research-based technological profession. We concluded (Smiraglia and Leazer 1994, 45):

> In sum, *LRTS* by and large reflects the growth of a maturing, scholarly discipline surrounding the orientation paradigms that ALCTS exists to serve.

I am pleased to reiterate this conclusion as my term draws to a close. *LRTS* reflects the continued maturation of the subdisciplines surrounding collections and technical services, which are themselves healthy, vital, research-based parts of our field. As I leave *LRTS* in the capable hands of Jennifer Younger, I am proud to have been a part of the development of our profession.

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Eva Verona, 1905–1996: An Appreciation

Michael Carpenter

Eva Verona (Trieste, February 1, 1905– Zagreb, May 19, 1996) was a Croatian librarian who, when she entered the international arena for the revision of cataloging rules, made many enduring contributions to the way we do things today.

Eva Verona's education was in physics and mathematics in the Faculty of Philosophy of the university in Zagreb. While a university student, she worked as a librarian in the Department of Surveying, developing a union catalog for Zagreb libraries of publications in physics and mathematics. This project later evolved into her first book, a 1941 list of library resources in Zagreb (Verona and Mišić-Jambrišak 1941). After graduating from the university in 1929, she started work in what was later to become the Croatian National and University Library. By the early 1950s, she had become the head of two departments in that library—those for printed library materials and technical services—continuing until her retirement in 1967. Starting in 1966, she became a senior lecturer at the University of Zagreb and continued in this position well into the 1980s.

At the time of Verona's work, Croatia was a constituent unit of a federal state, Yugoslavia. Her work was not confined to the narrowness of a single constituent republic, for Verona became the founding chair of the Yugoslav Committee on Cataloging, which was established by the Union of Library Associations of Yugoslavia in 1961.

Verona made several scholarly contributions to English-language library literature, including articles on form headings (Verona 1962), the early history of corporate entry (Verona 1956), and the distinction between literary units and bibliographical units (Verona 1959). The library resources she used in the composition of these articles are in a host of languages and must have come from a truly cosmopolitan collection of library literature. Today these studies are still marvels of clarity of exposition and contain excellent coverage of the relevant materials.

In these and other contributions, there are many references to Croatian cataloging practice, references that were to be systematized in her Croatian-language publications, in which Verona wrote what must be the most important core of that language's library literature. She wrote the two-volume Croatian cataloging code, one volume of which has appeared in two editions (Verona 1970–1983 and 1986), as well as a more scholarly treatment on the alphabetical catalog (Verona 1966 and 1971). The Croatian cataloging code was adopted by the library community in Yugoslavia as a whole. For many years, she was the chief editor of the journal *Vjesnik bibliotekara Hrvatske* [*Bulletin of Croatian Librarians*] (1950–) as well as a driving force in the Croatian library association, the Društvo bibliotekara Hrvatske.

According to Phyllis Richmond (1993), Verona first attended meetings of IFLA (International Federation of Library Associations) in 1952 and continued to do so for the next twenty-five years. Verona's work had its major effect on cataloging practice through her committee work in IFLA and work with IFLA-sponsored conferences.

As chair of the Yugoslav Cataloging Committee, Verona was a delegate to the International Conference on Cataloguing Principles (the "Paris" conference) of 1961 as well as a contributor of a working paper for the conference. In this working paper, Verona set forth a cardinal point of Croatian cataloging practice, the use of added entry or reference cards for uniform titles rather than inserting them in the main entry.

The Croatian cataloging rules work in a card catalog environment, but unlike those that used to be prevalent in the United States, the card catalog envisioned in these rules does not rely as consistently on unit card technology. Occasionally added entries are abbreviated, often taking the form of references to the main entry.

In today's online environment, the controversy over whether uniform titles should be part of the main entry or an added entry might appear pointless, pertinent only to the card catalog environment. Such a conclusion would be mistaken: Imagine finding a uniform title for a translated work arranged under the heading for a translator or an illustrator. The uniform title in that context makes one think of the translator or illustrator as author of the work when that is manifestly not the case. Such situations can easily be found in some online catalog displays.

The position enunciated by Verona in her Paris conference paper is similar to that found in her "Literary versus Bibliographical Unit" cited above. In the Paris conference, she was opposed by Seymour Lubetzky, who thought it best to make uniform titles part of the main entry, a position that has been adopted by most cataloging agencies today.

What is probably Verona's most important achievement in international cataloging unification came about as the struggle over corporate entry played itself out among various cataloging agencies. Her contributions are found in two books, the first a commentary on the Paris Principles and the second a full-length study, *Corporate Headings*.

During the Paris conference, several delegations found themselves unable to accept the idea of corporate authorship. In an attempt to gloss over differences, the delegates established a subcommittee to redraft section 9 of the draft *Statement of Principles*, which dealt with corporate entry. The committee succeeded in its task by composing a new section with ambiguous wording, a situation that has resulted in the existence of two tendencies in post-Paris codes, one accepting the idea of corporate authorship and the other accepting corporate main entry only in certain limited circumstances. An example of each of these tendencies can be found by contrasting the 1967 version of the *Anglo-American Cataloging Rules* and its acceptance of corporate authorship and the 1978 and 1988 versions of the same code, the *Anglo-American Cataloguing Rules* second edition (*AACR2*), with their denial of authorial status to corporate bodies.

With the possibility in mind of differing interpretations of the *Statement Of Principles*, which was supposed to unify international cataloging, the Paris conference decided that an annotated statement of principles should be issued. Although a preliminary edition was issued by A. H. Chaplin, it was deemed insufficient to deal with the needs of the profession. At the successor to the Paris conference, the International Meeting of Cataloguing Experts held in Copenhagen in 1969, it was decided to appoint a committee to provide a definitive annotated statement. Verona became the principal author of the new and final edition (Verona 1971). In addition to a historical commentary on the Paris principles, she also provided discussion and examples of how the principles are used in the various post-Paris codes. The most important chapter of the commentary relates to section 9 of the principles, that section dealing with corporate entry and in greatest need of reinterpretation. Here Verona documented the need for a new interpretation of section 9, but ended up by concluding that rewriting might prove to be hopeless.

After the unsatisfactory attempt at reinterpretation of the Paris provisions for corporate entry in the commentary, Verona attended the 1972 Budapest IFLA conference and, after lengthy discussions

with various delegations to the conference, agreed to undertake a new study of corporate headings (Anderson 1976), a study that would be published in 1975 as *Corporate Headings*. Verona elected to arrive at definitions of corporate bodies, corporate authorship, and corporate entries that followed a sort of common denominator approach, the common denominator being what all sides to the hotly disputed topic could agree upon. This approach, while not theoretically justifiable in and of itself, did bring a measure of international agreement on the subject.

On May 21, 1978, the Parliament of the Croatian Republic awarded Verona a Republic Medal for Life's Work. The citation mentions not only Verona's work on alphabetical cataloging theory, but also her work in the recovery of Croatian library materials that had been captured by other nations during World War II, work for which she had been previously honored with a Medal of Work with golden leaves by the republic's president. Additionally, she was honored for her work on both the current and retrospective Croatian national bibliographies (Gomerčić 1977–78).

Verona had to work in a multicultural environment within her home country, Yugoslavia, a country beset by differences in scripts for one common language (Serbian and Croatian are distinguished by the scripts in which they are written, Serbian being written in the Cyrillic and Croatian in the roman alphabet) and language differences among various parts of the country. When she began working in the international arena, she seemed admirably suited to bridging what appeared to be unbridgeable gaps in viewpoints, and her work is one of the reasons we can so easily speak about, and work with, international standards in cataloging today. This is no small achievement. I regret that I never met her but could only correspond with her.

It is perhaps worthwhile to remark that OCLC records no holdings in its member libraries for either the latest edition of Verona's Croatian cataloging code, or for her systematic treatise in Croatian on the subject. Verona's work in a multicultural

environment, her multilingualism (including her limpid style in English), and the substantial nature of her contributions to our field should focus a grim light on our country's current lack of interest in international and comparative studies.

According to Mirna Willer (1996), a definitive bibliography of Verona's work should appear soon; an earlier version was published in 1986 (Horvat and Blažvić 1986). Other information on Eva Verona's activities up through 1967 is available in an anonymous article on her life and work published in 1968 ("Eva Verona" 1968).

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Book Reviews

Gregory H. Leazer, Editor

From A to Z39.50: A Networking Primer. By James J. Michael and Mark Hinnebusch. Westport, Conn.: Mecklermedia, 1995. 166p. Paper. $35 (ISBN 0-88736-766-6).

The Z39.50 standard, as library professionals should all know by now, is a network protocol developed by the library community primarily for information retrieval among dissimilar, Machine-Readable Cataloging (MARC)-based bibliographic systems. It was adopted as an official standard of the National Information Standards Organization (NISO) and the American National Standards Institute (ANSI), NISO's parent body, in 1988; the most recent edition, known as Version 3, was issued in 1995.

In a very real sense and at long last, Z39.50 extends to the end-user many of the benefits in standardization and cooperation envisioned when the MARC formats were first developed. In its ideal implementation, Z39.50 will allow a library catalog user, using his or her own local system, to search a number of remote library catalogs in quick succession using the local system's commands and to see results conveyed in the local system's familiar, native display format. Virtually all major vendors of library automation, and a good number of providers of indexing and abstracting information, now offer access via Z39.50; the list of universities and other institutions that have implemented Z39.50 servers for their own library catalogs exceeds one hundred and grows daily.

Apart from the development of the MARC standard itself by the Library of Congress in the late 1960s, Z39.50 must be considered the signal contribution of libraries to information retrieval in this century, even though—after more than ten years of development—its promise is only now being realized. Unfortunately, for the most part, today's new global information market is characterized by dizzyingly fast technological obsolescence, and hard-won technology standards can easily be overwhelmed by popular and innovative proprietary approaches. Now that we finally have the promise of Z39.50 within our grasp, we might shortly have to face the urgent question of whether the new "wired" era will shortly relegate Z39.50 to the dustbin of good—but outmoded—ideas, or whether this visionary standard will survive to become one of the building blocks of libraries' quadrant of cyberspace.

While *From A to Z39.50* does not seriously attempt to address this new set of problems, it does serve as a useful summary of the origins of the standard and includes a detailed conceptual overview of the protocol as it was seen in late 1994 by two of the contributors to the standard, James J. Michael, vice-president of Data Research Associates, and Mark Hinnebusch, network administrator for the Florida Center for Library Automation.

The work is divided into twelve essays. The first six, by Michael, address the history and purpose of the standard, and the remainder, by Hinnebusch, discuss technical aspects of Z39.50 and related protocols. While both sections of the book convey a great deal of important information, there are, unfortunately, virtually no points of connection between the two. This is so much the case that one suspects a long distance collaboration or perhaps even two different books masquerading as one. A more cohesive work might have been better able to show the ways in which the protocol itself reflects both the peculiar requirements of the library commu-

nity and the particular standards develop-
ment process that was brought to bear.
Michael's sections, moreover, show a
repetitiveness and first person folksiness
that suggest the essays might have been
cobbled together from past speeches and
presentations, though this is nowhere
mentioned in the publication. In style his
essays too often rely on sweeping asser-
tions and exhortations rather than care-
fully-reasoned arguments. For example:
"Personally, I believe strongly in technical
standards, (i.e., standards that are arrived at
by consensus and that are formalized)" (p.
28) and "If anyone is not willing to acknow-
ledge [library] interdependency, then forget
about [Z39.50 information retrieval], ILL,
and document delivery. To talk only about
cooperative collection development and re-
source sharing is ... hypocrisy" (p. 42). How-
ever much one might agree with Michael,
the reader would be better served by less
posturing, fewer aphorisms, and a more
careful editorial hand.

Still, Michael is persuasive in many of
his chief arguments, among them the ob-
solescence of the ALA/NISO standards
process that has held sway for the last
fifteen or twenty years. He makes an elo-
quent plea for a process of modeling and
prototyping standards rather than simply
inventing them in committee. Further, he
reflects the same frustration with NISO's
dated paper- and fee-based approach to
standards publication that many in the
field have felt: "It seems ludicrous that we
spend time developing standards to prom-
ulgate as widely and as quickly as possible
and then insist on delaying promulgation
by publishing in print format and charging
for that print format. Months and dollars
could be saved by making these standards
available over networks" (p. 27). Of
course, Michael's point would have been
somewhat more persuasive if it had ap-
peared in an essay published for free over
the Internet rather than in a thin, $35
paperback book. Perhaps, however, Mi-
chael's views have already had some bene-
ficial effect, because Z39.50-1995 is now
available for free electronically in several
formats from the Library of Congress at:
http://lcweb.loc.gov/z3950/agency/
1995doce.html. Nevertheless, NISO has

not changed its overall policy in this re-
gard.

Michael's portion of the book does pro-
vide an excellent example of how the proc-
ess of creating library standards has ma-
tured during the last ten years and how
representatives for library automation
vendors, non-profit bibliographic utilities,
and research libraries have learned to col-
laborate on technical standards develop-
ment. Working together they have created
prototypes and testbeds to serve both
groups' interests. This is a process that
other NISO and ALA standards groups of
all kinds would do well to emulate.

This publication has the distinction of
being probably the only book length treat-
ment of Z39.50 (though LC's lack of an
established subject heading for the stand-
ard makes this difficult to determine with
absolute confidence). Most of the existing
literature on Z39.50 has so far been found
in journals, technical documents, listservs,
and World Wide Web sites, and those
wanting more comprehensive and up to
date information will have to seek it there.
The ideal audience for this book would
appear to be working library professionals
wanting to catch up in this important area
of technology and willing to mull over a
fair number of network protocol architec-
tural and process drawings along the way.
The book would seem to be ideal, as well,
for a library school survey course on net-
working thanks to shorter sections de-
scribing related networking standards, in-
cluding Transmission Control Protocol/
Internet Protocol (TCP/IP) and Open
Systems Interconnection (OSI). Serious li-
brary automation professionals, and those
aspiring to such work, will find this a useful
point of departure and a provocative discus-
sion of library standards-making.

Because *From A to Z39.50* mysteri-
ously includes neither a bibliography nor
a "webography," it is useful to cite here the
two major online information sources cur-
rently available: the Library of Congress'
Z39.50 maintenance agency site (http://
lcweb.loc.gov/z3950/agency/); and the In-
terNIC Z39.50 resources page (http://
ds.internic.net/z3950/z3950.html). The LC
site has grown to be quite comprehensive,
with its own bibliography, links to online

versions of papers on Z39.50, minutes of the Z39.50 Implementers Group (ZIG), and many other resources.

It might be a service to the library community to see either the authors or others working with the standard follow up this book with a series of essays, preferably made available online, that present in a relatively non-technical way some of the issues and design considerations that have arisen during more recent work. Some subjects worthy of discussion include the digital collections profile, the Computerized Interchange of Museum Information (CIMI) profile, ranked list query, the Inter-Library Loan (ILL) protocol, and structured vocabulary browse proposal. Beyond these, of course, lie the larger questions: in a world of creative, new, non-library-based indexing and retrieval services such as Alta Vista, Excite, Lycos, and the many others to come—services with huge composite megaindexes that will in due course include a great deal of bibliographic information— will there still be a need for Z39.50's approach to intersystem communication? Further, when document ordering, browsing, reading, and "microcharging" can all take place over the Web, directly at the publisher's Web site, will there still be a role for Z39.50 at all?—*Stephen Paul Davis, Columbia University*

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Knowledge-Based Systems for General Reference Work: Applications, Problems, and Progress. By John V. Richardson, Jr. San Diego: Academic Press, 1995. 355p. (ISBN 0-12-588460-5). LC 94-31851.

Two monographs on the subject of expert systems for reference services were published before this book. The first, entitled *Expert Systems In Reference Services*, was originally published as a special issue of *Reference Librarian* in 1989. It contains eleven articles that describe the potential of expert systems and document

several microcomputer-based prototypes (Roysdon & White, 1989). Alberico and Micco (1990) share a scope similar to that in Richardson's book. Both provide a general introduction to artificial intelligence and expert systems, and address the modeling of reference services. Although both books include surveys of expert system applications in reference services, Alberico and Micco's is more a broad overview, while Richardson treats the subject in more depth.

In the first half of chapter 1, Richardson systematically explores the history of reference teaching and the reference paradigm. Richardson does so by examining the tools for teaching: its textbooks. Individual textbooks are considered in chronological order, and Richardson devotes a separate section to each one discussed; the name of the textbook writer serves as the section heading. Each section begins with brief background information about the textbook writer followed by an analysis of the book itself. The fact that Richardson almost always begins each section with a biographical note on the textbook writer lends his study a decidedly historical flavor. In analyzing the textbooks, Richardson looks for answers to three questions: (a) How are reference works arranged (i.e., format)? (b) How is reference work described (i.e., method, or so called procedural knowledge)? and (c) How does the reference librarian interact with the user (i.e., mental traits)? By considering these questions, Richardson is able to explore the three basic facets of a paradigm for teaching reference work. That paradigm is discussed in detail in the second half of the chapter.

Chapter 2 defines an expert system by briefly outlining its major aspects: its history, types of knowledge, inference engine, system interface, the major AI (artificial intelligence) programming languages, and knowledge elicitation methods. Richardson justifies the role of expert systems in library and information science (LIS) in the final section of this chapter, by pointing out all groups of people who should have vested interests in expert system development.

In chapter 3 Richardson argues that reference work is a viable domain for rule-based expert systems. On one side of the rule (i.e., condition) reference questions are broken down by category. On the other side (i.e., conclusion) answers are provided according to formats of reference sources. Richardson relies heavily on speculation when discussing boundary considerations, likelihood of success, and the philosophical and ethical issues of expert system development.

A flowchart model of general reference transactions is the theme of chapter 4, "Modeling the Reference Transaction." This model is explained in detail and is heavily supported by another excellent historical study on research in reference transactions.

Chapter 5 develops a blueprint of an expert system for general reference work; this is based on the procedural-rule model introduced in chapter 3. Richardson takes the time to explain not only the basic-level rules for various formats of reference sources but also the tree structure of subordinate-level knowledge for each format of reference sources. Although Richardson presented the tripartite paradigm of reference work in chapter 1, the blueprint presented here primarily utilizes the format facet of that paradigm.

Chapter 6, written by three former Richardson students, deals with a peripheral topic of this book: the criteria used to evaluate expert system shells. It begins with a very brief introduction to expert system shells, and proceeds to give a list of criteria for selecting an appropriate expert system shell. These criteria are grouped into the following sections: knowledge base, methods of reasoning, interface, update and editing, end-user interface, software, hardware, training, documentation, and cost. This chapter builds on the introductory text in chapter 2 and addresses the application level of expert system research.

The issue of user interface in a reference expert system is the topic of chapter 7, written by Karen Howell. Early in the chapter, Howell reviews research on user interface and identifies some misconceptions about user interface design. This is followed by specific suggestions on user interface design for a general reference expert system.

Chapter 8, complements the discussion in chapter 6 on the application level of expert system research by providing a catalog of prototype and commercial expert systems in reference services. A total of fifty-seven projects are described, with each project given a separate section. Information about each project includes the name of the project's principal investigator, staff, and domain experts. Richardson also provides detailed information about the hardware, software, scope, system size, user interface, special features, perceived benefits, and cost. This extensive catalog is followed by an essay that evaluates recent progress. The typical knowledge-based system in reference service, Richardson summarizes, "has been built by one or two people using a shell" for an academic library environment; "it is a relatively uninspired system, not based on a theoretical model of reference transactions." He concludes that "it is much easier to create a first-generation prototype than it is to put an operational KBS [knowledge-based system] into place," and calls for the research and development of second-generation expert systems (p. 294). However, Richardson does not clarify in this chapter what might distinguish first- and second-generation expert systems from one another.

The final chapter emphasizes the future of expert systems for reference services and its constraints and consequences. At the core of this chapter is an attempt to describe past constraints, dispel current doubts, and provide optimism for the future. An appendix gives a checklist of criteria for selection and an annotated listing of more than 20 available expert system shells.

Richardson's monograph is a record of several research projects he has conducted in the past few years that had the purpose of further understanding the teaching and practice of reference work. The numerous awards that chapters of this book have received show the strengths of this book: comprehensive scope; in-depth and well-documented reviews; and superb, systematic organization. Many chapters of the book can serve

as excellent sources for different groups of readers: educators studying reference textbooks, researchers modeling reference transactions, and students with advanced knowledge in the development of expert systems in general and application of reference services in particular. Researchers and advanced students who study expert systems in other areas, such as cataloging and classification, will find individual chapters valuable for surveying the subject area. Readers will be delighted to find the extensive reference notes at the end of individual chapters and the bibliography at the end of the book.

Having said that, however, it is necessary to point out several of the book's weaknesses. Richardson's overall arrangement is problematic. The division of chapters into three headings (applications, problems, and progress) seems arbitrary, and the explanation of this tripartite structure in the preface (p. xii) is confused and unconvincing. Chapters 2 and 3 appear to be out of place in relationship to the book's other theoretical discussions on reference work. Richardson's own recommended teaching order (p. viii) is further evidence that the chapters are not arranged in logical order. The arrangement of chapters contributes to another problem in the book: the lack of a smooth transition between chapters. This problem might be due partially to the fact that some chapters were written as independent research papers, although Richardson could have solved it by giving users more help in his introduction. Finally, the historical research in this book, while contributing to the strength of chapters 1, 4, and 8, also contributes to an imbalance in the depth of perspective on the subject areas treated. The comprehensive, well-documented historical reviews contrast sharply with the weaker generalizations and speculations on the future of expert systems. One wonders whether Richardson is as confident in, and positive about, the future of expert system research as he is about its history.

Research on expert systems enjoyed almost a decade of popularity among LIS researchers since its introduction to our field by Smith, who wrote her dissertation in 1979. Like much technology-related work, this research began with high hopes and enormous potential, and stimulated numerous experiments and prototypes. Researchers and advanced students spent countless hours reading textbooks on expert systems and learning about artificial intelligence programming languages. The common purpose among many designers of expert systems in LIS was, in most cases, to identify a very narrow domain of library operations and to codify what many saw as the simple rules and procedures of those operations into procedural knowledge of an expert system. But because the researchers studied narrow domain and simple routine library tasks— and made no attempt to study the formidable issue of knowledge acquisition and representation—it proved impossible to transform their prototypes into successful operational systems. As the majority of projects faded or were forgotten near the end of 1980s, many researchers concluded that expert systems offered more limitations than possibilities and thus moved on to other topics. One of the few traces left from LIS expert system research is the keen awareness, among some researchers, of the need to study the conduct and learning process of LIS professional knowledge and skills. Richardson provides an important contribution to the area of LIS expert system research by analyzing reference teaching and reference transactions through historical studies and surveys.—*Ling Hwey Jeng, School of Library and Information Science, University of Kentucky*

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Roysdon, Christine and Howard White. 1989. *Expert systems in reference services*. New York: Haworth.

Smith, Linda C. 1979. *Selected artificial intelligence techniques in information retrieval systems research*. Ph.D. diss., Syracuse University.

The Closing of American Library Schools: Problems and Opportunities. Larry J. Ostler, Therrin C. Dahlin, and J. D. Willardson. Contributions in Librarianship and Informa-

tion Science, no. 85. Westport, Conn.: Greenwood, 1995. 176p. $49.95 (ISBN 031328461X).

As library schools struggle to reinvent themselves for the Information Age, it is helpful to speculate as to why some of the most prestigious library schools in the country have closed in recent years. Library schools have been caught off guard in a suddenly hostile environment. However, this work does not go into the reasons why specific library schools closed. Instead, the authors present ideas for discussion.

This book begins with an examination of the history of library schools and higher education in the United States. The authors then go on to assess the present challenges that library schools face and possible strategies for overcoming these challenges. Finally, the authors present their own ideas for future library school programs and curricula. The lengthy section of appendixes (over half the book) provides examples of accreditation standards, mission statements, and library programs in use today.

Two chapters offer a historical perspective. The first outlines the evolution of higher education in the United States. Demographic, political, and economic factors all played a role in fashioning higher education into what it is today. Especially relevant is the section on professional education (p. 11), which was first elevated to higher education at Harvard around the turn of the century.

The next chapter provides a history of library education in America. It would have been interesting to learn more about how library schools became established in America but the authors present only a brief summary. The authors analyze Melvil Dewey's impact, claiming that Dewey "led the profession astray" (p. 23) by emphasizing practice over theory. The authors note the apparent lack of founding thinkers in library science, although they do mention a number of names, including Ralph Shaw and Jesse Shera. They return to this lack of a theoretical basis for library science in a later chapter.

In the next five chapters of the book, the authors discuss the present and future of library education in America. Chapter 4 discusses the "paradigm shift" that library schools have failed to notice. They cite Daniel Bell's argument that society is experiencing a shift "from an industrial to a postindustrial society where information has become a prime commodity" (p. 25). This shift began in the early 1960s. New trends in science and technology, such as computer networks, began to alter library work but library schools failed to notice these new trends. New organizational structures also emerged with new attitudes towards management, and library schools failed to recognize these new management styles as well.

Chapter 5 returns to the unanswered question that hangs over the faculty of every library school: is there a science to library science? If so, what is the body of scientific knowledge? If you ask one librarian, you get the answer that cataloging is the core of librarianship. If you ask another, you get the answer that helping the community is the core of librarianship. There is no agreement on a general body of knowledge. And the body of knowledge that does exist continues to fragment as schools devise new curricula.

In the next three chapters, the future of library education is considered. In Chapter 6, the authors present an argument for developing and implementing strategic plans in library schools because "the failure to plan effectively contributed to the decline and closing of some library schools" (p. 37). The authors give some examples of problems in planning and offer some solutions.

In Chapter 7, the processes of certification and accreditation are examined. The authors feel that more rigorous certification of professionals will strengthen the position of library schools. The authors believe that quantitative and qualitative standards should be established for librarians to receive certification, and for library programs to be accredited. The authors point to several other professions that have instituted basic standards. Accountants and teachers both have to meet professional standards in order to work in the profession or belong to professional organizations. Archivists have a certification process. The

authors mention the American Library Association's standards for accreditation of library schools but they seem to feel that the ALA's standards do not meet the demands of the new marketplace that library schools face.

Chapter 8 presents the authors' ideas for redesigning library education, pointing to several areas in library education that need reform. The authors advocate strengthening the professional degrees by adding prerequisites for admission into a professional program, lengthening the degree program beyond a year, introducing areas of specialization into the curriculum, creating an undergraduate degree in information science, and abandoning accreditation for a free-market approach.

The authors present a new curriculum where undergraduate instruction would teach students basic library skills equivalent to paraprofessional skills in a library. The graduate programs would teach more theory, building on the basic skill set learned in undergraduate education. Doctoral study would involve further research and study of theory.

Although there is a rich academic history in the field of library and information science, it is doubtful that many students will want to study it for five or six years. Paraprofessional skills require mastering repetitive, mundane tasks such as filing or data processing. While these skills run a library, they are not worth studying at a university level, and do not form the basis of a liberal education—the foundation upon which many professions (including librarianship) is formed.

The authors also fail to take into account the low wages in the library field. What incentive is there to spend years in school preparing for a profession that pays below the average salary of other professions with comparable responsibilities? A professional school is only as good as the profession it serves. Among other reasons, students are willing to spend three years in law school because they know they can make a decent salary when they graduate. Library school graduates, on the other hand, are some of the lowest paid professionals in the country. Library schools cannot dictate the terms of the profession;

they must instead respond to the needs of the profession.

When one examines the history of library education in America, one sees that library schools, as the authors point out, have always been pressured by external forces. Library schools emerged at the turn of the century as the number of libraries in America increased and demand for librarians grew. Andrew Carnegie and other captains of industry were willing to spend money to develop a network of libraries across the country. At the same time, professional schools began to affiliate with universities in an effort to improve quality. From the very beginning, library schools were tied to universities—with Dewey opening the first library school at Columbia University in 1887.

After World War II, the United States government realized that scientific research and development was of critical importance to national security. Throughout the Cold War period, universities received massive research and development funding from the government. Library schools were affiliated with many of these universities. As the universities grew wealthy, the library schools shared the good fortune.

Since the Cold War ended, research and development have no longer been as great a national security issue. Government funding for research and development has dried up and universities that had grown fat from forty years of funding suddenly have had to become lean and mean. Library schools, never the glamorous centerpiece of any institution, have fallen victim to the budgetary ax as universities trimmed their costs in the new environment. Wedded to universities, library schools must share the fate of higher education.

There is a great need for information skills in the new postindustrial age described by the authors. The Internet presents a whole new chaotic world of information for catalogers to control and reference librarians to explore and explain. It is hoped that leaders of the library profession and of programs of library and information science will recognize this and maybe, one day, librarians will earn more.—*Barrett Jones, RAND Corporation*

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Index

Volume 40, 1996

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b. titles—of articles and of articles about which letters were published
c. subjects—of articles and of books reviewed
Subject entries for individuals are identified by "*(about)*"; letters are identified by "*(c).*"
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Entries are arranged word by word following the "file-as-spelled" principle. Numbers are arranged before alphabetical characters; acronyms without internal punctuation are arranged as words.
Subject headings are based on: *ASIS Thesaurus of Information Science and Librarianship,* edited by Jessia L. Milstead (Medford, N.J.: Published for the American Society for Information Science by Learned Information, Inc., 1994).

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